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APPENDICES TO YUMA MAINTENANCE PLAN

EXECUTIVE SUMMARY

Yuma County comprises the southernmost part of the Colorado River Valley. Yuma, the county seat, is located just below the confluence of the Colorado and Gila Rivers. The cities of Phoenix and Tucson are located 185 miles to the northeast and 241 miles to the east, respectively. San Diego, California is 181 miles west of Yuma, and Los Angeles is 288 miles to the northwest.

The nonattainment area is geographically located in the Lower Colorado River Valley in the southwestern part of Yuma County in a vast area of the Sonoran Desert. The Yuma PM_{10} Nonattainment Area contains a total of 16 full and partial townships. This is the equivalent to about 12 full townships, comprising about 456 square miles or 300,000 acres. The nonattainment area is defined by the following townships (40 CFR § 81.303):

> T7S- R21W, R22W;
> T8S-R21W, R22W, R23W, R24W
> T9S-R21W, R22W, R23W, R24W, R25W;
> T10S-R21W, R22W, R23W, R24W, R25W.

Review of the ambient air concentrations for calendar years 2002, 2003, and 2004 reveals that the 3-year annual average was 43.4 ug/m^3. The design value is 87 percent of the annual standard. Yuma air quality did not violate the annual standard for the three-year period from 2002 through 2004.[1] Thus, the Yuma area attained the annual PM_{10} NAAQS.

Based on the most recent three years of air quality data (2002, 2003, and 2004), the 24-hour average design value for the Yuma area is 127 ug/m^3. The design value is 85 percent of the 24-hour standard. This plan demonstrates that the control measures modeled to reduce the 24-hour design value will concomitantly reduce the annual design value.

ADEQ modeled attainment for both the 24-hour PM_{10} NAAQS and the annual PM_{10} NAAQS through 2016 for the Yuma air quality planning area. This maintenance plan predicts attainment for the next 10 years. If an exceptional event causes the Yuma area to exceed the 24-hr average NAAQS, ADEQ will flag the event as a natural event and begin the procedure required by EPA to update the Yuma NEAP. If the exceedance occurs outside of the Yuma Nonattainment Area, it will not be flagged.

[1] PM_{10} concentrations reported at the Juvenile Center monitoring site in Yuma showed one exceedance of the 24-hour PM_{10} NAAQS caused by a high wind event on August 18, 2002. According to EPA's Natural Events Policy (NEP), this measurement does not count as a violation. Consequently, the three-year average number of exceedances was less than 1.0.

1.0 BACKGROUND

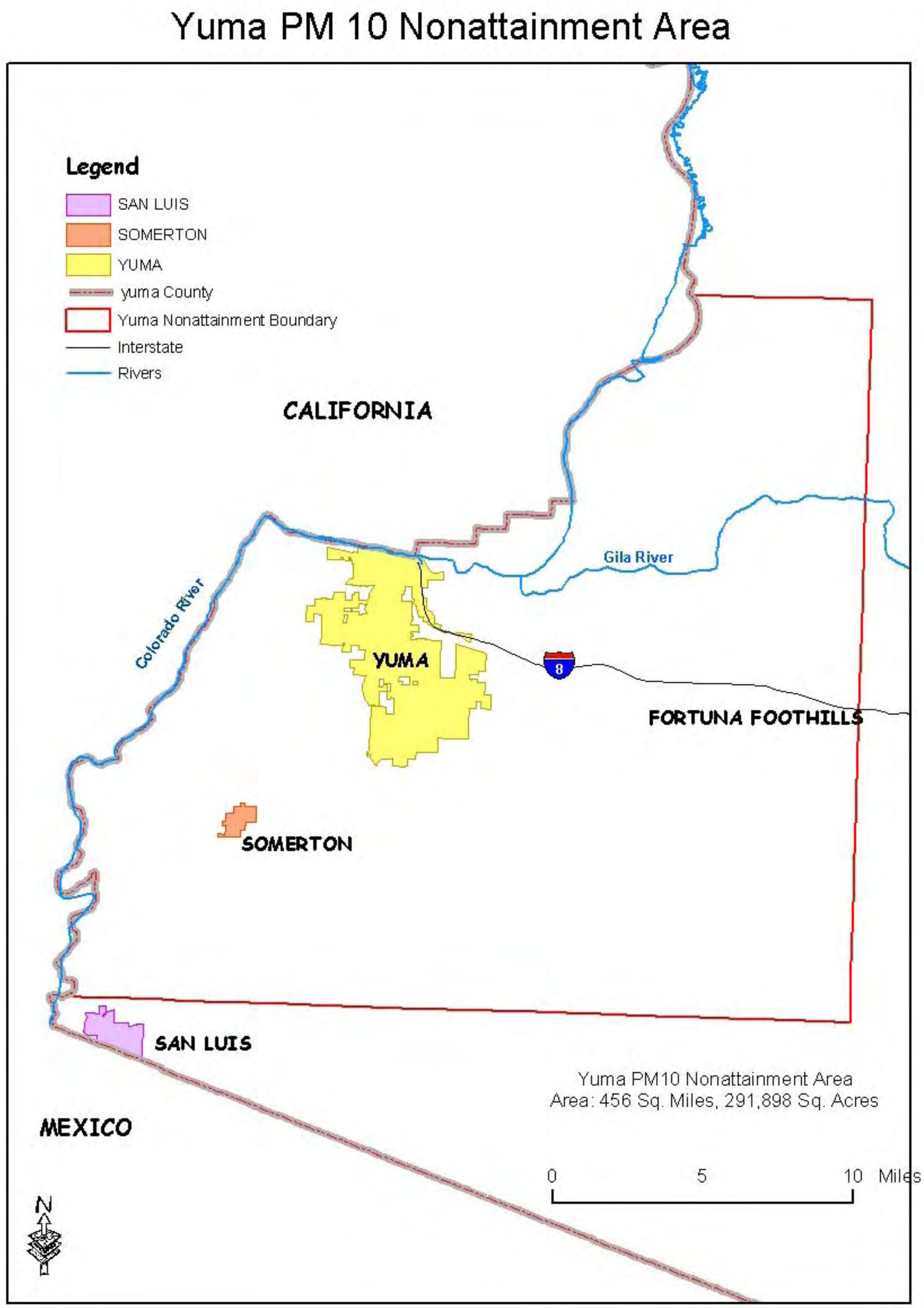
1.1 Yuma Moderate PM_{10} Nonattainment Area

Yuma County comprises the southernmost part of the Colorado River Valley. Yuma, the county seat, is located just below the confluence of the Colorado and Gila Rivers. The cities of Phoenix and Tucson are located 185 miles to the northeast and 241 miles to the east, respectively. San Diego, California is 181 miles west of Yuma and Los Angeles is 288 miles to the northwest.

The nonattainment area is geographically located in the Lower Colorado River Valley in the southwestern part of Yuma County in a vast area of the Sonoran Desert (see Figure 1-1). The Yuma PM_{10} Nonattainment Area contains a total of 16 full and partial townships. This is the equivalent to about 12 full townships, comprising about 456 square miles or 300,000 acres. The nonattainment area is defined by the following townships (40 CFR § 81.303):

T7S- R21W, R22W;
T8S-R21W, R22W, R23W, R24W
T9S-R21W, R22W, R23W, R24W, R25W;
T10S-R21W, R22W, R23W, R24W, R25W.

Figure 1-1



Yuma PM 10 Nonattainment Area
Legend
SAN LUIS
SOMERTON
YUMA
yuma County
Yuma Nonattainment Boundary
Interstate
Rivers
CALIFORNIA
Colorado River
Gila River
YUMA
8
FORTUNA FOOTHILLS
SOMERTON
SAN LUIS
MEXICO
Yuma PM10 Nonattainment Area
Area: 456 Sq. Miles, 291,898 Sq. Acres
0
5
10
Miles
N

1.2 Climate

Yuma is Arizona's warmest winter city and the sunniest year-round place in the United States, with an annual average of 4,133 hours of sunshine. Yuma has a classic low desert climate with extremely low relative humidity and very high summer temperatures. Yuma is one of the driest cities of its size in the United States, with a mean annual precipitation of 2.94 inches, based on a 30-year average. It lies too far south to benefit from the winter fronts which impact northern Arizona and it lies too far west to receive rain associated with the summer monsoons.

Table 1-1 depicts the monthly climate summary for Yuma. The table was compiled by the Western Regional Climate Center from data for Yuma from September 1, 1945, to March 31, 2005. Although the winters in Yuma are rather mild, the summers are very hot. Table 1-1 reveals that July is the hottest month with an average maximum temperature of 107.0°F. January is the month with the lowest average maximum temperature with an average maximum temperature of 68.5°F.

With respect to average minimum temperatures, July is the month with the highest average minimum temperature of 80.4°F. The month with the lowest average minimum temperature is January at 44.1°F.

Table 1-1

Yuma Monthly Climate Summary													
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Annual**
Average Max. Temperature (F)	68.5	74.3	79.2	86.8	94.0	103.4	107.0	105.8	101.6	91.0	77.7	68.7	88.2
Average Min. Temperature (F)	44.1	46.9	51.0	56.9	63.7	72.1	80.4	79.9	73.8	62.4	51.0	44.4	60.6
Average Total Precipitation (in.)	0.43	0.22	0.23	0.12	0.05	0.01	0.22	0.51	0.27	0.29	0.19	0.43	2.96

Period of Record: 9/1/1945 to 3/31/2005

SOURCE: Western Regional Climate Center

1.3 Population

The principal communities in the Yuma PM_{10} Nonattainment Area are the Cities of Yuma and Somerton. Since 1970, the population of Yuma has increased more than two and one-half times while the population of Somerton has more than tripled. After adjusting for the La Paz County split, Yuma County experienced a similar growth pattern by tripling its population during the same time period. Similarly, Arizona's population also tripled.

During the 1970s, Yuma County grew at a rate of 25.3 percent while Yuma and Somerton grew at rates of 46.4 percent and 78.4 percent, respectively. The growth rates of Yuma and Somerton were similar during the 1980s and 1990s. Yuma County, however, grew at a greater rate during both the 1980s (40.3%) and 1990s (49.7%). Decennial census data for Yuma, Somerton, and Yuma County are shown in Table 1-2.

The Census population noted above does not take into account the Yuma area's seasonal population. Norton Consulting estimates that 56,000 winter visitors/residents were in the Yuma Metropolitan Statistical Area (MSA) in mid-February (2005), the traditional peak of the season. The winter visitors come to Yuma to enjoy the mild winter climate.

Table 1-3 portrays 1997 growth projections by the Arizona Department of Economic Security (DES) for the cities of Yuma, Somerton, and Yuma County in five-year increments from 2000 to 2015. Projected populations for Yuma and Yuma County for 2000 and 2005 are significantly less than the 2000 Census enumerated populations. Likewise, the projected population for Somerton for 2000 is less than the 2000 Census enumerated population. In 2015, the City of Somerton is projected to have a population of 9,001. This amounts to a projected increase of 23.9% over its 2000 census population. The projected 2015 population for the City of Yuma is 90,271. This is a projected increase of 16.5% over Yuma's 2000 census population. Yuma County's 2015 projected population is 189,783. This amounts to a projected increase of 18.6%.

Table 1-2. Decennial Census Population of Yuma, Somerton, and Yuma County: 1970 - 2000

Year	April 1 1970	April 1 1980	April 1 1990	April 1 2000
Yuma	29,007	42,481	56,966	77,515[2]
Yuma's decennial change		46.4%	34.1%	36.1%
Somerton	2,225	3,969	5,282	7,266
Somerton's decennial change		78.4%	3.1%	37.6%
Yuma County	60,827	76,205	106,895	160,026
Yuma County's decennial change		25.3%	40.3%	49.7%

SOURCE: U.S. Bureau of the Census, decennial census counts. The northern part of Yuma County was split into La Paz County with the southern part retained as Yuma County on January 1, 1983. The 1980 Yuma County population does not contain the population that was enumerated in the La Paz County portion. The 1970 Census comprises the original Yuma County boundary.

[2] The 2000 Census shows a population of 77,515 with 34,475 housing units of which 26,649 are occupied (22.7% vacant). The number of occupied housing units equals the number of households residing in Yuma with 2.79 persons per household. Yuma also has a group quarters population of 3,144. Persons not living in households are included in group quarters. Group quarters is classified into institutionalized persons (patients or inmates) and noninstitutionalized persons (rooming houses, group homes, dormitories, shelters, and similar quarters).

Table 1-3. Population Projections for Yuma, Somerton, and Yuma County: 2000 - 2015

Year	July 1, 2000	July 1, 2005	July 1, 2010	July 1, 2015
Yuma	67,809	74,347	81,836	90,271
Somerton	6,729	7,475	8,224	9,001
Yuma County	138,025	154,582	171,689	189,783

Source: Arizona Department of Economic Security, August 1, 1997. DES has not produced any new population projections for Arizona since 1997.

1.4 Economy

Agriculture is the primary industry in Yuma, and its health helped offset some of the impacts of the post 9-11 economic downturn. In the second quarter of 2005, 8,001 people in Yuma County were employed in Agriculture, Forestry, Fishing and Hunting. Agriculture contributed over $800 million to Yuma County's economy in 2002. Yuma County also ranks highest in Arizona in terms of crop production and livestock raising.

Yuma County's net cash farm income in 2002 was over $338 million, amounting to 51.8% of the total net cash farm income for all of Arizona. Yuma County ranked first in the state in the production of Durum wheat for grain, land in orchards, acres in vegetables, and winter wheat for grain in 2002; it ranked second in the state in the production of Pima cotton in 2002.[3]

Yuma County is the Nation's winter salad bowl, producing 85-90% of the Nation's winter vegetables. There are times during mid-winter and into the early spring when fully 90-95% of the iceberg lettuce for the United States and Canada comes from Yuma County fields.

The tourism industry in Yuma has remained healthy, despite fears of a potential drop in tourist traffic following the terrorist attacks that occurred on September 11, 2001. The industry has seen a significant expansion of capacity in new RV parks and hotels. Since most of Yuma's visitors arrive via automobile, tourism has only been moderately affected by the recent economic slowdown. The summer tourist season is not as important in Yuma.

[3]U. S. Census of Agriculture, 2002.

The government, and especially the military, plays a major role in the local economy. Home to the Marine Corps Air Station and the U.S. Army Yuma Proving Grounds, the military presence in Yuma is estimated to generate almost $260 million annually in terms of an economic impact on the metro area. The military presence is a stabilizing force, providing a boost to the local economy.

Employment growth in Yuma County is expected to accelerate in the coming years. Population growth and low-business costs will remain the two structural drivers for growth in the Yuma area. Although employment opportunities exist in several key economic sectors, many job creations may be low paying or seasonal. In the longer term, Yuma County employment growth is expected to continue to grow due to strong in-migration.

Table 1-4 contains employment data by economic sectors for Yuma County for the years 2000-2005. These data represent annual averages through 2004 and the average of the first one-half of 2005. The total civilian labor force grew by more than 17 percent from 2000 through 2004. If the civilian labor force maintains the growth during the first one-half of 2005, the overall growth rate for the years 2000 through 2005 would be about 26 percent.

According to Table 1-4, employment sectors registering more than 30 percent growth between 2000 and 2004 include the following, in descending order of growth: Administrative and Waste Services, Professional and Technical Services, information, Construction, Transportation and Warehousing, and Health Care and Social Assistance. Employment sectors showing declines or growth less than 12% include the following: Management of Companies, Wholesale Trade, Utilities, Agriculture, Forestry, Fishing, and Hunting; Mining; Professional and Technical Services; Finance and Insurance; Retail Trade; and Other Services. The other sectors showed employment gains ranging from 15 percent to almost 27 percent. Employment growth for Public Administration and Manufacturing sectors, for example, was approximately 26 percent each.

Table 1-4. Employment by Sector for Yuma County: 2000–2005

Employment Sector	2000	2001	2002	2003	2004	2005
Total Civilian Labor Force	52,303	54,705	55,960	58,014	61,415	65,960
Agriculture, Forestry, Fishing, and Hunting	14,349	14,751	15,347	14,860	15,254	15,636
Mining	24	N/R	N/R	N/R	22	25
Utilities	414	424	435	430	443	395
Construction	3,006	3,063	3,390	3,661	4,370	4,664
Manufacturing	2,337	2,145	1,840	2,531	2,933	3,248
Wholesale Trade	1,916	1,926	1,714	1,694	1,578	1,742

Employment Sector	2000	2001	2002	2003	2004	2005
Retail Trade	6,416	6,690	6,385	6,460	7,172	7,837
Transportation and Warehousing	1,083	1,219	1,328	1,318	1,441	1,404
Information	783	863	953	1,056	1,147	1,144
Finance and Insurance	667	674	668	683	739	757
Real Estate and Rental and Leasing	651	645	687	668	720	753
Professional and Technical Services	626	669	748	871	965	1,155
Management of Companies	152	138	120	120	119	121
Administrative and Waste Services	1,428	1,691	2,010	2,770	2,259	2,259
Educational Services	4,251	4,371	4,547	4,723	5,039	5,440
Health Care and Social Assistance	4,180	4,585	4,912	5,270	5,498	5,666
Arts, Entertainment and Recreation	1,209	1,212	1,228	1,266	1,408	1,393
Accommodation and Food Services	4,203	4,469	4,413	4,490	4,840	5,486
Other Services	1,144	1,144	1,110	1,066	1,118	1,158
Public Administration	3,376	3,958	4,069	4,030	4,279	5,597
Unclassified	88	68	56	47	71	80

Source: Arizona Department of Economic Security, Research Administration, in cooperation with the U.S. Department of Labor, Bureau of Labor Statistics, ES-202 (covered employment and wages). Some data corrections were made. Data for 2005 represent an average of 1st and 2nd quarters of 2005. Economic sectors based on North American Industrial Classification System. N/R=Not Reported.

Table 1-5 shows a selected time series of civilian labor force data for the City of Yuma and Yuma County for the timeframe 2000–2004. Complete data for 2005 were not available at the time of this writing. Table 1-5 reveals that for every year during this timeframe, the unemployment rate for Yuma County was over 15 percent. The unemployment rate for the City of Yuma, however, was slightly lower than that for Yuma County, being around 12 percent.

Table 1-5. Civilian Labor Force and Unemployment Data for City of Yuma and Yuma County*

Year	2000	2001	2002	2003	2004
City of Yuma civilian labor force	34,999	35,245	37,106	39,126	40,328
City of Yuma unemployment rate	12.7%	12.6%	12.8%	12.9%	11.8%
Yuma County civilian labor force	64,370	64,793	68,272	72,004	73,938
Yuma County unemployment rate	16.6%	16.4%	16.7%	16.8%	15.4%

Source: Arizona Department of Economic Security, Research Administration, Unemployment Rates and Labor Force Statistics (LAUS), 2005.
*Data are not seasonally adjusted.

1.5 Yuma Area Air Quality History

The Yuma area was designated as a moderate PM_{10} nonattainment area by operation of the 1990 Clean Air Act Amendments. The area violated the 24-hour PM_{10} National Ambient Air Quality Standard (NAAQS)[4] in 1990 and 1991 and had violated the annual NAAQS[5] in 1989 and 1990. ADEQ completed a state implementation plan (SIP) for the Yuma Moderate PM_{10} Nonattainment Area in 1991. Although the plan demonstrated attainment of the 24-hour and annual NAAQS through implementation of reasonably available control measures (RACM), EPA found the plan to be incomplete. ADEQ identified additional RACM being implemented in the Yuma area and updated the plan in 1994. Based on these additional control measures, the 1994 plan demonstrated attainment of the PM_{10} NAAQS by even a greater margin. EPA has never approved the SIP for the Yuma area.

Since 1991, the Yuma area had not violated either the 24-hour or annual NAAQS up until 2002. As a result of several years of “clean data”, ADEQ began developing a maintenance plan and redesignation request for the Yuma area in 2001, because the improvements in local air quality were permanent and enforceable. ADEQ identified the various stakeholders in the Yuma area; these stakeholders include the local jurisdictions, the metropolitan planning organization, the agricultural community, federal agencies, two Native American tribes, a water users’ association and irrigation districts, and the Arizona Department of Transportation. ADEQ began working with the stakeholders in July 2001 in developing the maintenance plan and redesignation

[4] The 24-hour average PM_{10} standard is 150 ug/m^3. Concentrations at or below this amount are not a violation of the 24-hour standard. The 24-hour average PM_{10} monitored values for the Yuma area were 270 ug/m^3 in 1990 and 229 and 188 ug/m^3 in 1991.

[5] The annual average standard is 50 ug/m^3. Concentrations at or below this amount are not a violation of the annual standard. The annual average PM_{10} monitored values for the Yuma area were 52 ug/m^3 in 1989 and 57 ug/m^3 in 1990.

request and continued to do so until an exceedance of the 24-hour NAAQS occurred once again in Yuma on August 18, 2002, as a result of a massive thunderstorm that generated strong winds and windblown dust.

High wind events are a type of natural event covered by EPA's Natural Events Policy (NEP). Under the NEP, ADEQ developed and submitted a Natural Events Action Plan (NEAP) to EPA on February 17, 2004. As a result of this exceedance, the maintenance plan was temporarily postponed until ADEQ completed a NEAP for the Yuma area. The NEAP contains strategies that are currently being implemented by the local jurisdictions in the Yuma area to reduce particulates in the event of future high wind conditions in the Yuma area.

The NEP states that best available control measures (BACM) must be implemented for controllable sources of PM_{10} within 3 years after the first NAAQS violation attributed to high wind events. Consequently, ADEQ completed a report on the implementation of the BACM contained in the Yuma NEAP. ADEQ submitted the NEAP implementation report to EPA on February 17, 2005.

2.0 CLEAN AIR ACT REGULATORY REQUIREMENTS

As a consequence of being designated nonattainment for the PM_{10} NAAQS, the Yuma area is required under the Clean Air Act Amendments (CAAA) of 1990 to meet certain legal requirements to attain the NAAQS and ensure that the area will comply with the NAAQS for the 10-year maintenance period following redesignation. The specific legal requirements are described below.

2.1 CAA Section 110(a)(2) – Enforceable Emissions Limitations and Other Control Measures

Section 110(a)(2)(A) of the CAA requires States to provide for enforceable emissions limitations and other control measures, means, or techniques, as well as schedules for compliance with the PM_{10} national ambient air quality standards. Chapter 6 includes a list of control measures that helped the Yuma area reach attainment and maintain the PM_{10} NAAQS up to the maintenance out-year of 2016.

Section 110(a)(2)(B) of the CAA requires States to monitor, compile, and analyze PM_{10} monitoring data on ambient air quality. Under ADEQ's air quality assessment program, ambient monitoring networks for air quality have been established to sample pollution in a variety of representative settings, to assess the health and welfare impacts, and to assist in determining air pollution sources. These networks cover both urban and rural areas of the State. Chapter 3 includes monitoring network information and data for the Yuma area. The samplers are certified as Federal Reference or Equivalent Methods. The protocol for PM_{10} monitoring used by the State, local agencies, and companies was established by EPA in 40 CFR Part 50, Appendices J and K and 40 CFR Part 58, Appendices A, D, and E.

Section 110 (a)(2)(C), Section 110 (a)(2)(E), Section 110 (a)(2)(F), and Section 110 (a)(2)(L) of the CAA requires States to have permitting, compliance, and source reporting authority. Arizona Revised States (ARS) § 49-402 establishes ADEQ's permitting and enforcement authority. As authorized under ARS § 49-402, ADEQ retains adequate funding and employs adequate personnel to administer the air quality program. Appendix A includes the organizational chart for ADEQ's Air Quality Division.

Under ADEQ's air quality compliance program, major sources are inspected annually, while minor sources are inspected every two to three years. However, minor sources may be inspected more frequently if they have had a record of problems in the past.

Section 110(a)(2)(G) of the CAA requires that States provide for authority to establish emergency powers and authority and contingency measures to prevent imminent endangerment. AAC R18-2-220 prescribes the procedures the Director of ADEQ shall implement in order to prevent the occurrence of ambient air pollution concentrations which would cause significant harm to the public health. As authorized by ARS § 49-426.07, ADEQ may seek injunctive relief upon receipt of evidence that a source or combination of sources is presenting an imminent and substantial endangerment to public health or the environment.

2.2 CAA Section 172(c) – Nonattainment Area Plan

Section 172(c) of the CAA requires that nonattainment plan provisions comply with each of the following:

Section 172(c)(1) of the CAA requires that nonattainment plan provisions provide for the implementation of all reasonably available control measures (RACM) as expeditiously as practicable and demonstrate attainment of the primary NAAQS. Chapter 6 includes a description of RACMs already implemented in the Yuma area to control PM_{10} emissions.

Section 172(c)(3) and Section 172(c)(4) of the CAA require a current inventory of actual emissions from all sources of the relevant pollutant or pollutants and projected emission inventories. The 1999 base-year emissions and the 2016 projected emissions for the Yuma Nonattainment Area are contained in Chapter 4.

Section 172(c)(5) of the CAA require permits for the construction and operation of new or modified major stationary sources. All new sources and modifications to existing sources in Arizona are subject to State requirements for preconstruction review and permitting pursuant to AAC, Title 18, Chapter 2, Articles 1, 3, 4, and 5. All new major sources and modifications to existing major sources in Arizona are subject to the New Source Review (NSR) provisions of these rules, including Nonattainment Area Analysis (NAA) and Prevention of Significant Deterioration (PSD). The State NSR program was conditionally approved by EPA in 1982, but since then has been revised and is currently awaiting approval from EPA.

2.3 CAA Section 175A(d) – Contingency Provisions

Section 175A(d) requires the maintenance plan to contain contingency provisions that will assure that the State will promptly correct any violation of the PM_{10} NAAQS which occurs after the redesignation of the area as an attainment area. The provisions must also include a requirement that the State will implement all the control measures contained in the state implementation plan for the area before the redesignation of the area as an attainment area. Chapter 6 contains the control measures currently implemented in the Yuma area. Chapter 7 contains the contingency measures that will be implemented in the Yuma area in case of a future violation.

2.4 CAA Section 176(c)(1) – General Conformity

The CAA contains general conformity requirements that currently apply to federal agency-related activities, except transportation projects,[6] in the Yuma Moderate PM_{10} Nonattainment

[6]The Clean Air Act requires that transportation plans, programs, and projects in nonattainment or maintenance areas that are funded or approved by the Federal Highway Administration or Federal Transit Authority be in conformity with the state implementation plan through a separate process described in the transportation conformity regulation (Title 40 C.F.R., Parts 51 and 93, November 24, 1993, as amended in August and November 1995).

Area (40 C.F.R. §§ 93.150 - 160). The same requirements will continue to apply when the Yuma area is legally designated a maintenance area. The regulations are intended to ensure federal actions are consistent with state and local air quality planning. A conformity analysis must clearly demonstrate that federal projects will not: 1) cause or contribute to any new violations of the NAAQS; 2) interfere with provisions in the applicable SIP for compliance with the NAAQS; or 3) increase the frequency or severity of NAAQS violations. Any federal agency engaging, sponsoring, permitting or approving an action in the Yuma Nonattainment Area is responsible for making the conformity determination, in consultation with ADEQ. Those federal agencies in the Yuma area that must comply with the general conformity requirements are the BLM, BOR, Federal Aviation Administration (FAA), Department of Homeland Security, Marine Corps Air Station (MCAS), and the U.S. Army Yuma Proving Grounds.[7] Chapter 7 contains ADEQ's commitment to enforce Article 14 of the Arizona Administrative Code. ADEQ has incorporated by reference Title 40 CFR Part 93, Subpart B in Arizona Administrative Code R18-2-1438.

2.4.1 Commitment to Meet General Conformity Requirement

ADEQ commits to work with the Federal agencies in the Yuma Moderate PM_{10} Maintenance Area to ensure that the CAA Sections 118 and 176 and 40 C.F.R. §§ 93.150 - 160 will be met for applicable federal projects. Examples given by EPA Region IX of Federal actions that have required conformity determinations in the past include: construction of a water treatment facility on federal land; construction of a new airport runway; expansion of a mine or quarry operation owned or operated by a Federal agency; residential housing construction on military installations; and increased aircraft and motor vehicle activity on military installations.[8]

2.5 CAA Section 176(c)(2) – Transportation Conformity

The CAA of 1977 contains transportation conformity requirements which state that transportation plans, programs, and projects in nonattainment areas cannot:

- cause NAAQS violations;
- increase the frequency or severity of existing NAAQS violations; or
- delay attainment of the NAAQS for the relevant pollutants in nonattainment areas.

The CAA requires that transportation improvement programs (TIPs), plans, and projects in nonattainment or maintenance areas that are funded or approved by the Federal Highway Administration (FHWA) or the Federal Transit Administration (FTA) be in conformity with state implementation plans, including maintenance plans. The conformity process is

[7] Arizona's general conformity program was submitted to EPA as a SIP revision in 1995. The program was approved on April 23, 1999 and became effective on June 22, 1999 (64 FR 78).

[8] These examples of activities requiring a conformity analysis were provided in a personal communication with Doris Lo, Environmental Program Specialist, in the EPA Region IX Air Division Planning Office.

described in EPA's transportation conformity regulation Title 40 CFR Part 93, Subpart A. Other projects that must undergo a transportation conformity analysis include:

- regionally significant[9] transportation projects not funded or approved by FHWA and/or FTA, but sponsored by recipients of FHWA/FTA funds, and
- regionally significant projects in rural nonattainment or maintenance areas.

2.5.1 Agencies Responsible for Transportation Conformity Determinations

The Yuma Metropolitan Planning Organization (YMPO) and the U. S. Department of Transportation (USDOT) have the responsibility to ensure that the transportation plans and programs within the Yuma Nonattainment Area conform to the maintenance plan. The policy board of the YMPO must formally make a conformity determination regarding its transportation plan and TIP prior to submitting them to the U.S. DOT for review and approval.

YMPO consults with the Air Quality Division of ADEQ in its preparation of its annual air quality analysis report.

2.5.2 Frequency of Transportation Conformity Determinations

Conformity determinations must be made at least every three years, or as changes are made to plans, TIPs, or projects. Certain events may also trigger new conformity determinations; for example:

- SIP revisions that establish or revise a transportation-related emissions budget or

- SIP revisions that add or delete transportation control measures (TCMs).

2.5.3 Motor Vehicle Emissions Budget

The foundation for a conformity determination is the motor vehicle emissions budget in the latest submitted or approved SIP. The motor vehicle emissions budget in the SIP acts as a ceiling for the transportation plan and TIP emissions. The motor vehicle emissions budget for the Yuma Nonattainment Area is contained in Chapter 4.

2.5.4 ADEQ's Role in Implementing Transportation Conformity

The Clean Air Act Amendments of 1990 made conformity requirements substantially more rigorous. In November 1993, EPA issued its final rulemaking (58 FR 62188)

[9]"Regionally significant project" means a project that serves regional transportation needs and would normally be included in the modeling of a metropolitan area's transportation network. This includes, as a minimum, all principal arterial highways and all fixed guide-way transit facilities that offer a significant alternative to regional highway travel.

implementing the new requirements. ADEQ was subsequently required to adopt an Arizona transportation conformity rule (A.A.C. R18-2-1401 through 1438) that was enforceable by the State and submit the rule to EPA as a revision to the SIP. ADEQ submitted the rule to EPA on June 20, 1995.

In July 1997, EPA revised its 1993 rule, providing state and local governments more authority in setting performance measures as tests of conformity. The 1997 rule also gave state and local governments more discretion at times when transportation plans do not conform to the SIP. ADEQ was required to revise its State rule to reflect the changes in EPA's 1997 rule and submit the updated rule as a SIP revision. As the result of the March 2, 1999, U.S. Circuit Court decision,[10] ADEQ is in the process of revising its transportation conformity rule.

2.6 CAA Section 189 – Plan Provisions and Schedules for Plan Submissions

2.6.1 Permit Requirements

Section 189 requires that the state implementation plan for the Yuma area include a permit program providing that permits meeting the requirements of section 173 are required for the construction and operation of new and modified major stationary sources of PM_{10}. All new sources and modifications to existing sources in Arizona are subject to State requirements for preconstruction review and permitting pursuant to AAC, Title 18, Chapter 2, Articles 1, 3, 4, and 5. All new major sources and modifications to existing major sources in Arizona are subject to the New Source Review (NSR) provisions of these rules, including Nonattainment Area Analysis (NAA) and Prevention of Significant Deterioration (PSD). The State NSR program was approved by EPA in 1982, and has been revised since then. A revision was submitted in 1995 but never acted upon. The program will be revised and resubmitted in 2006.

2.6.2 Attainment or Nonattainment Demonstration

Section 189 requires that the state implementation plan for the Yuma area include a demonstration that the plan will provide for attainment by the applicable attainment

[10] On March 2, 1999, the U.S. Court of Appeals for the District of Columbia issued its opinion in Environmental Defense Fund (EDF) v. Environmental Protection Agency (No. 97-1637). The Court ruled against EPA on all issues. The Court ruled that EPA's 1997 rule, which allowed non-federally funded projects to be approved when the conformity status of a transportation plan or program has lapsed, violates the CAA requirement that all projects come from a currently conforming transportation plan and program. The Court also ruled that EPA's 1997 rule, which allowed projects previously found to conform with a SIP and approved for federal funding when the conformity status of a transportation plan and program has lapsed, violates the CAA requirement that all projects come from a currently conforming transportation plan and program. The Court ruled that EPA must harmonize the use of the emissions budget in currently disapproved SIPs with the CAA requirement that federal agencies affirmatively find that federal actions will not cause or contribute to new air quality violations, increase the frequency or severity of existing violations or delay timely attainment of the NAAQS. There is no longer a 120-day grace period before projects are frozen if a SIP is disapproved.

date or a demonstration that attainment is impracticable by that date. The 1991 Yuma SIP demonstrated attainment of the PM_{10} 24-hour and annual NAAQS by December 31, 1994. The 1994 revision to the SIP demonstrated attainment by an even greater margin.

2.6.3 Provisions to Implement Reasonably Available Control Measures

Section 189 requires the plan for the Yuma area to contain provisions to assure that the RACMs for the control of PM_{10} be implemented no later than December 10, 1993. The local jurisdictions in the Yuma area had implemented their RACMs by this date and these control measures were enough to bring the area into attainment by December 31, 1994. The control measures that are being implemented in the Yuma area are contained in Chapter 6.

2.7 Applicable Clean Air Act Requirements with Respect to Redesignation

2.7.1 Redesignation to Attainment

Section 107(d)(3)(E) of the Clean Air Act (CAA), as amended, states that an area can be redesignated to attainment if the following conditions are met:

a) The NAAQS have been attained[11].

Chapter 3 makes the case that the 24-hr PM_{10} NAAQS and the annual average PM_{10} NAAQS have both been attained based on the most recent three years of monitoring data. EPA's Direct Final Rule determining that Yuma has attained the PM_{10} NAAQS beginning in 1998 became effective May 15, 2006 (71 FR 13021).

b) The applicable implementation plan has been fully approved under Section 110(k).

The applicable plan is this Maintenance Plan submitted for approval pursuant to Section 175A of the Clean Air Act. ADEQ commits to revising this Maintenance Plan eight years after redesignation, as required by Section 175A.

c) The improvement in air quality is due to permanent and enforceable reductions in emissions.

Sections 1.3 and 1.4 of this Chapter described the population and economic growth that has been occurring in Yuma and Yuma County. Chapter 3 reveals that there has not been a violation of the PM_{10} NAAQS in Yuma since 1991, except for an unusual

[11] Attainment of the 24-hour standard is determined by calculating the expected number of days in a year with PM_{10} concentrations greater than 150 ug/m^3. The 24-hour standard is attained when the expected number of days with levels above 150 ug/m^3 (average over a three year period) is less than or equal to one. Attainment of the annual PM_{10} standard is achieved when the annual arithmetic mean PM_{10} concentration over a three-year period is equal to or less than 50 ug/m^3 [40 CFR 50.6 (a) and (b)].

wind event in 2002. Chapter 6 describes the control measures that are currently in place to control PM_{10} emissions in the Yuma area and attain the NAAQS. Clearly, the improvement in air quality in Yuma is due to permanent and enforceable reductions in PM_{10} emissions. These reductions are expected to maintain the Yuma area in compliance with the PM_{10} NAAQS to at least 2016, the out-year of the maintenance plan.

d) A maintenance plan with contingency measures has been fully approved under Section 175A.

This document is the PM_{10} maintenance plan for the Yuma area. The contingency measures for Yuma are contained in Chapter 7. ADEQ has every expectation that EPA Region IX will fully approve this maintenance plan when submitted to EPA in 2006.

e) The State has met all applicable requirements for the area under Section 110 and Part D.

ADEQ's fulfillment of these requirements is described in detail in Section 1.0 of Chapter 2 of this plan.

2.8 Applicable EPA Guidance

In the process of completing the maintenance plan for Yuma and fulfilling the requirements of a maintenance plan fully approvable by EPA, ADEQ referred to the guidance documents listed below:

a) PM_{10} SIP Development Guideline, U.S. Environmental Protection Agency, OAQPS, EPA-450/2-86-001, Research Triangle Park, NC, June 1987;

b) Procedures for Processing Requests to Redesignate Areas to Attainment, John Calcagni, Director, Air Quality Management Division, memorandum dated September 4, 1992;

c) PM_{10} Emission Inventory Requirements, U.S. Environmental Protection Agency, OAQPS, Research Triangle Park, NC, September 1994; and

d) Reasonable Further Progress, Attainment Demonstration, and Related Requirements for Ozone Nonattainment Areas Meeting the Ozone National Ambient Air Quality Standard, John S. Seitz, Director, Office of Air Quality Planning and Standards (MD-10), May 15, 1995.

2.9 Requirements for Nonattainment Areas that Have Attained the NAAQS

In EPA's Clean Data Finding for the Yuma PM_{10} area, EPA determined that the following Section 172(c) planning requirements no longer apply: (1) reasonable further progress (RFP) requirements, (2) attainment demonstration, and (3) nonattainment area contingency measures. EPA deems the area to have already attained the NAAQS and to have met RFP.[12] General requirements for redesignation are listed below:

1. The area must be attaining the PM_{10} NAAQS based on the three most recent years of quality assured monitored air quality data.

Chapter 3 reveals that the Yuma monitoring site during the period of 2002–2004 showed one measured exceedance (170 ug/m^3) of the 24-hour PM_{10} NAAQS, due to a natural wind event in the Yuma area. ADEQ flagged this event pursuant to EPA's Natural Events Policy (NEP) and Arizona's Natural and Exceptional Events Policy (NEAP) 0159.000, and EPA concurred. Consequently, this reading has been excluded from the attainment calculation for Yuma. Review of the 24-hour averages for calendar years 2002, 2003, and 2004 reveals that the highest 24-hour average was 127 $\mu g/m^3$; review of the annual standard reveals that the 3-year annual average was 43.4 $\mu g/m^3$. Thus, the Yuma area also attained the annual PM_{10} NAAQS. See Section 2.7.1 for discussion of EPA's Clean Data Finding.

2. The State must continue to operate an appropriate PM_{10} air quality monitoring network, in accordance with 40 CFR Part 58, in order to verify the attainment status of the area.

The State continues to operate the Yuma monitoring network, in accordance with 40 CFR Part 58, in order to verify the attainment status of the area. The Yuma monitoring network is described in Chapter 3 of this plan.

3. The control measures for the area, which were responsible for bringing the area into attainment, must be approved by EPA as meeting reasonably available control measures (RACMs) and reasonably available control technology (RACT) requirements.

The control measures for the area, which were responsible for bringing the area into attainment, are described in Chapter 6 of this plan. The State anticipates that EPA will approve these measures as meeting RACM and RACT requirements. In addition, the abatement measures and BACM selected for the Natural Events Action Plan (NEAP) and this Maintenance Plan are included in Chapter 6. The Yuma PM_{10} planning area was classified as a Moderate PM_{10} area.

4. An emissions inventory must be completed for the area.

[12] *Reasonable Further Progress, Attainment Demonstration, and Related Requirements for Ozone Nonattainment Areas Meeting the Ozone National Ambient Air Quality Standard*, John S. Seitz, Director, Air Quality Planning and Standards (MD-10), memorandum dated May 25, 1995, page 3.

An emissions inventory has been completed for the Yuma area, and a detailed description is contained in Chapter 4 of this plan and in the Technical Support Document.

5. EPA must make a finding that the area attained the 24-hour and annual PM_{10} NAAQS.

PM_{10} concentrations reported at the Yuma monitoring site between 2002 and 2004 showed no measured exceedance of the 24-hour PM_{10} NAAQS, other than the flagged exceedance with which EPA concurred. Thus, the three-year average was less than one exceedance per year, which demonstrates Yuma attained the 24-hour PM_{10} NAAQS. The highest 24-hour reading was 127 $\mu g/m^3$, well below the 150 $\mu g/m^3$ 24-hour NAAQS. Review of the annual standard for calendar years 2002, 2003, and 2004 reveals that the 3-year annual average was 43.4 $\mu g/m^3$; thus, the Yuma area also attained the annual PM_{10} NAAQS. Based on clean data 1998 to date, EPA made a Clean Data Finding effective May 15, 2006.

In addition to these requirements, any requirements that are connected solely to designation or classification, such as new source review (NSR) and RACM/RACT, must remain in effect. Chapter 6 includes a description of RACMs implemented in the Yuma area to control PM_{10} emissions. It also contains a description of BACMs included in the Yuma NEAP. No sources are currently subject to BACT in this planning area. The requirement under CAA Section 172(c) for reasonable further progress (RFP) demonstrations is waived by the Clean Data Finding. Finally, transportation and general conformity requirements continue to apply in the Yuma area. The use of the Clean Data Policy does not constitute a CAA Section 107(d) redesignation, but only serves to fulfill one of the requirements for redesignation.

2.10 Clean Air Act Requirements for Maintenance Plans

Section 107(d)(3)(E) of the CAA stipulates that for an area to be redesignated, EPA must fully approve a maintenance plan that meets the requirements of Section 175A. Section 175A defines the general requirements of a maintenance plan. These requirements are as follows:

1. The maintenance plan is a SIP revision.

The maintenance plan must provide for maintenance of the relevant NAAQS in the area for at least ten years after redesignation. Chapter 6 demonstrates that the control measures in place in the Yuma area are adequate to maintain the PM_{10} NAAQS until the out-year 2016.

2. The maintenance plan shall contain additional control measures necessary to ensure maintenance of the PM_{10} NAAQS.

Section 175A of the CAA states that the maintenance plan shall contain additional measures, if necessary, to ensure maintenance of the relevant NAAQS for ten years after redesignation. The control measures are described in Chapter 6 of this plan. The U.S. Army's emission factor study scheduled for completion in 2009 may lead to further control measures, should they become necessary to maintain the standard.

3. The maintenance plan must be revised eight years after redesignation.

Section 175A also requires that the state submit a revision of the maintenance plan eight years after the original redesignation request is approved to provide for the maintenance of the NAAQS for an additional ten years following the first 10-year period. ADEQ commits to revise this maintenance plan eight years after the effective date of redesignation.

4. The maintenance plan must contain contingency measures.

Section 175A of the CAA requires that a maintenance plan include contingency provisions, as necessary, to promptly correct any violation of the NAAQS that occurs after redesignation of the area. These contingency measures are different than those generally required for nonattainment areas under Section172(c)(9). For the purposes of Section 175A, the contingency measures do not have to be fully adopted in order for the maintenance plan to be approved. Chapter 7 describes the contingency measures contained in this maintenance plan and the trigger for them. At a minimum, the contingency measures must include a requirement that the State will implement all measures contained in the nonattainment SIP prior to redesignation.

5. Core Provisions

In addition to the requirements listed above, the maintenance plan should contain core provisions that will be necessary to ensure maintenance of the relevant NAAQS in the area seeking redesignation from nonattainment to attainment.

a. The state should develop an attainment emissions inventory.

EPA has made a clean data finding for Yuma. An emissions inventory is in this Maintenance Plan and is further explained in the TSD to this Maintenance Plan.

b. The state should make a maintenance demonstration.

The state may generally demonstrate maintenance of the NAAQS by either showing that future emissions of the relevant pollutant will not exceed the level of the attainment inventory or by modeling to show that the future mix of sources and emission rates will not cause a violation of the NAAQS. The demonstration should be for a period of ten years following the redesignation. The maintenance demonstration through 2016 is in Chapter 5.

c. The state should continue to operate its monitoring network.

Once an area has been redesignated, the state should continue to operate an appropriate air quality monitoring network, in accordance with 40 CFR Part 58, to verify the attainment status of the area. The maintenance plan should contain provisions for continued operation of air quality monitors that will provide such verification. ADEQ commits to operate the air quality monitor on a continual basis in the Yuma area in Chapter 7.

d. The state should verify continued attainment.

The state should ensure that it has the legal authority to implement and enforce all measures necessary to attain and to maintain the NAAQS. A.R.S. § 49-404 and A.R.S. § 49-406 provide this authority to Arizona.

2.11 NEAP Policies and Requirements

In addition to CAA requirements, NEP policy requirements must also be fulfilled in the Yuma area. The following section goes into the specific requirements as they related to the Yuma area.

2.11.1 Overview

High wind events, like the event that occurred in Yuma on August 18, 2002, are a type of natural event covered by EPA's NEP (Areas Affected by PM-10 Natural Events, Memorandum, 1996, Mary D. Nichols). The NEP required ADEQ to submit a NEAP to EPA by February 18, 2004, or eighteen months after the exceedance. ADEQ worked with local governments and stakeholders to develop the Yuma NEAP, including the identification of and commitment to implement best available control measures (BACM) to satisfy the requirements for abating sources of dust. The deadline for full implementation of control measures was August 18, 2005.

2.11.2 EPA Natural Events Policy

On May 30, 1996, EPA issued the NEP in a memorandum from Mary D. Nichols, Assistant Administrator for Air and Radiation. This memorandum announced EPA's new policy for protecting public health in all areas where the PM_{10} standard is violated due to natural events. Under this policy, EPA stated that, under certain circumstances, it is appropriate to exclude PM_{10} air quality data that are attributable to uncontrollable natural events from the decisions regarding an area's nonattainment status.

EPA's NEP sets forth the requirements for high PM_{10} concentrations caused by natural events. Under this policy, three categories of natural events are identified as affecting the PM_{10} levels: 1) volcanic and seismic activity; 2) wildland fires; and 3) high wind events such as the one that precipitated the Yuma NEAP. The NEP defines high wind events as follows:

> "High Winds: Ambient PM_{10} concentrations due to dust raised by unusually high winds will be treated as due to uncontrollable natural events under the following conditions: (1) the dust originated from nonanthropogenic sources, or (2) the dust originated from anthropogenic sources controlled with best available control measures (BACM)."

2.11.3 Natural Events Action Plan Requirements

In the event of a PM_{10} violation of the NAAQS caused by a natural event in a moderate PM_{10} nonattainment area, the state can develop and submit to EPA a plan of action to address future events. The following is a summary of the EPA guidance regarding development of a NEAP as provided in the NEP. The NEAP should:

1) Include documentation and analysis of the event showing a clear causal relationship between the measured exceedance and the natural event. Documentation of natural events and their impact on measured air quality should be made available to the public for review.

2) Be developed in conjunction with the stakeholders affected by the plan.

3) Identify, study, and implement practical mitigating measures as necessary. The NEAP may include commitments to conduct pilot tests of new emission reduction techniques. The NEAP must contain a timely schedule for conducting such studies. A state has eighteen months after the submittal of the NEAP to EPA to implement measures that are technologically and economically feasible.

4) Include programs that abate or minimize appropriate contributing controllable sources of PM_{10}. Programs to minimize PM_{10} emissions may include application of BACM to any sources of soil that have been disturbed by anthropogenic activities. The state has eighteen months after the submittal of the NEAP to EPA to implement these BACM. The Yuma area BACM were implemented within this timeframe. ADEQ documented the BACM in a NEAP implementation report. ADEQ sent the report to EPA on February 17, 2005.

5) Establish public notification and education programs. The public notification and education program in the Yuma area is designed to educate the public about the short-term and long-term harmful effects that high concentrations of PM_{10} could have on their health and inform them that: (a) certain types of natural events affect the air quality of the area periodically; (b) a natural event is imminent; and (c) specific actions are being taken to minimize the health impacts of events.

6) Include programs that help minimize public exposure to unhealthy concentrations of PM_{10} due to future natural events.

7) Be made available for public review and comment.

8) Be submitted to EPA for review and comment.

9) Commit the State to periodically reevaluate: (a) the conditions causing violations of a PM_{10} NAAQS in the area; (b) the status of implementation of the NEAP; and (c) the adequacy of the actions being implemented. ADEQ will reevaluate the Yuma NEAP every five years and make appropriate changes to the plan.

Under the NEP, ADEQ developed and submitted a Natural Events Action Plan (NEAP) to EPA on February 17, 2004. The NEAP contains strategies that are currently being implemented by the local jurisdictions in the Yuma area to reduce particulates in the event of future high wind conditions in the Yuma area. The NEP states that best available control measures (BACM) must be implemented for contributing sources of PM_{10} within 3 years after the first NAAQS violation attributed to high wind events. Consequently, ADEQ completed a report on the implementation of the BACM contained in the Yuma NEAP. ADEQ submitted the NEAP implementation report to EPA on February 17, 2005.

3.0 AIR QUALITY MONITORING FOR YUMA AREA

The primary goal of monitoring in the Yuma/Somerton area is to collect the necessary data to ensure the maintenance area remains in compliance with the primary PM_{10} NAAQS. Toward that goal, the objective of monitoring in the Yuma Valley is to fulfill the regulatory requirements for PM_{10} monitoring throughout the 10-year maintenance period.

ADEQ established the Yuma County Juvenile Center monitoring site in February 1988, to assess particulate concentrations in the Yuma area. The monitoring site has been designated the state and local air monitoring station (SLAM) site, neighborhood scale for population exposure. SLAMS sites are established by ADEQ to fulfill requirements of Section 110(a)(2)(B) of the CAA. ADEQ is required to monitor, compile, and analyze PM_{10} monitoring data on the ambient air quality of Yuma. The Yuma PM_{10} monitoring site is designed to measure concentrations in an area of population density. The Yuma sample frequency is every 6th day. The sample duration is 24 hours starting at 12:01am (midnight). The national 1 in 6 schedule is set by EPA.

3.1 Quality Assurance Procedures for Air Quality Monitoring

In Yuma, PM_{10} monitoring is conducted under the Final Draft Quality Assurance Project Plan for the Air Assessment Section, dated November 9, 2001. PM_{10} samples are collected with a dichotomous air monitor, using an EPA equivalent method designation.[13] An electrically powered air sampler draws ambient air at a constant volumetric flow rate, controlled by a microprocessor, into a specially shaped inlet where the suspended particulate matter in the PM_{10} size range is separated for collection on a 47mm polytetrafluoroethylene (PTFE) filter.

Each filter is weighed at the ADEQ Filter Lab in Phoenix (after moisture and temperature equilibration) before and after sample collection to determine the net weight (mass) gain due to collected PM_{10}. The lab is maintained at EPA-specified conditions. The total volume of air sampled is determined by the sampler from the measured flow rate at actual ambient temperature and pressure and the sampling time. The mass concentration of PM_{10} in the ambient air is computed as the total mass of collected particles in the PM_{10} size range divided by the actual volume of air sampled, and is expressed in micrograms per actual cubic meter of air.

The data are reviewed using the three-level quality system before receiving final validation. These data are then formatted, summarized into the appropriate quarterly or annual averages, and reported to the ADEQ air assessment ambient database (AAAD) and the EPA Air Quality System (AQS) database. The air sampler is

[13] Equivalent method means a method for measuring the concentration of an air pollutant in the ambient air that has been designated as an equivalent method in accordance to 40 CFR Part 53 Subpart A; it does not include a method
for which an equivalent method designation has been canceled in accordance with § 53.11 or § 53.16.

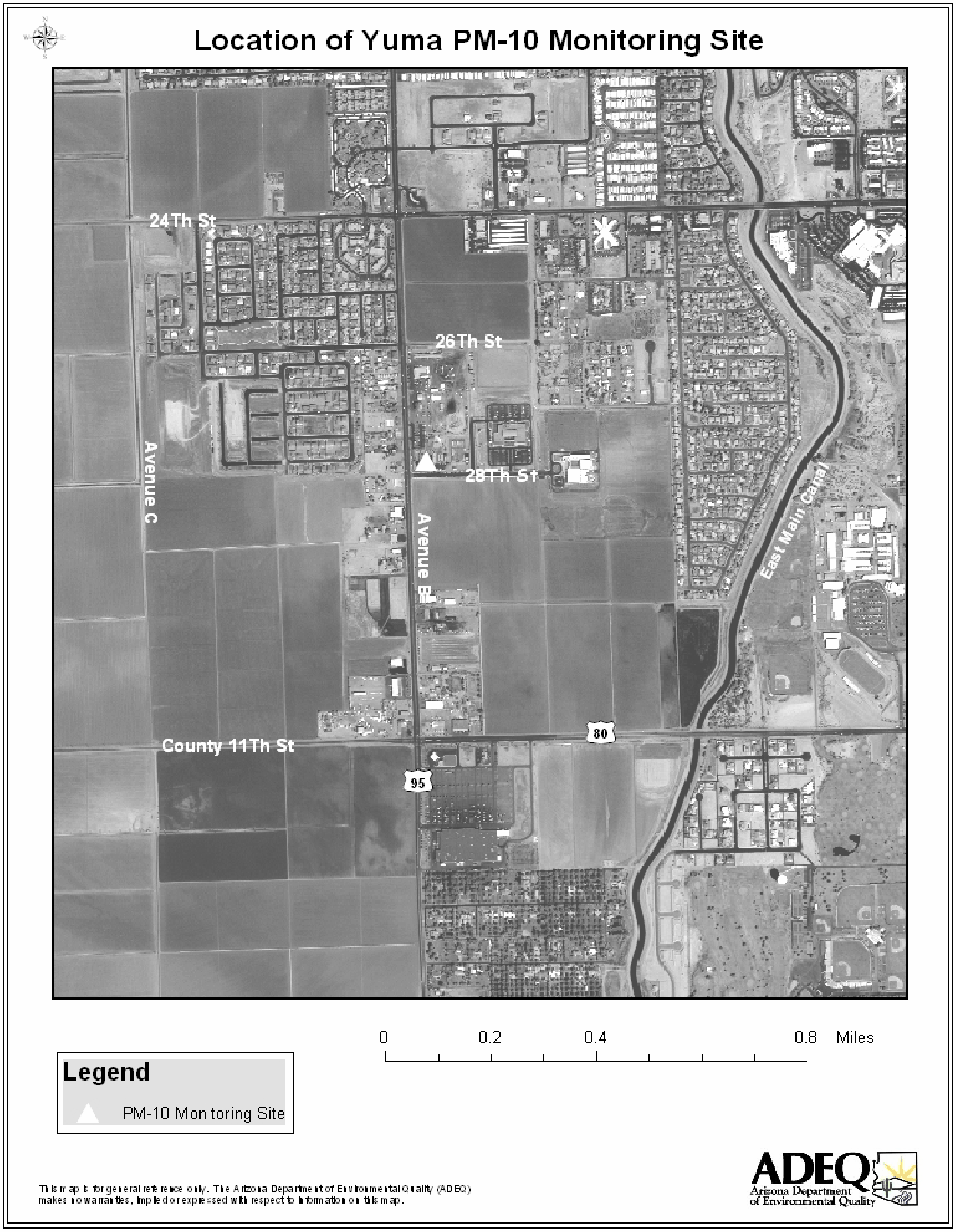
operated in accordance with applicable CFR requirements and quality assurance guidance. Regular checks of the stability, reproducibility, precision, and accuracy of the samplers and laboratory procedures are conducted by ADEQ.

The initial location of the Yuma monitor, method, and parameters measured are detailed below in Table 3-1. Figure 3-1 shows the location of the Juvenile Center Monitoring Site in Yuma. The dichot samplers were moved from the Yuma Juvenile Center Monitoring Site to the Yuma County Courthouse Monitoring Site on June 13, 2002. Both dichots were replaced with one partisol sampler on August 6, 2002. A second Partisol sampler was added at the Yuma County Courthouse Monitoring Site for precision and accuracy on July 2, 2004.

Table 3-1. Parameters of the Yuma Monitoring Sites

Site Address	Began Operating	Latitude	Longitude	Type of Device	Parameters Measured	Classification	Scale	Objective
2795 Ave. B, Yuma, AZ	1988	32° 40'	114° 39'	Dichotomous Sampler	PM_{10}	State and Local Air Monitoring Station	Neighbor-hood	General population exposure
2440 W. 28th St, Yuma, AZ	2002	32° 40'	114° 38'		Filter based PM_{10} R&P 2000 (duplicate measurement for precision), continuous PM_{10} with BAM1020	State and Local Air Monitoring Station	Neighborhood	Population exposure
Source: Air Quality Division, Assessment Section, 2005								

Figure 3-1


Location of Yuma PM-10 Monitoring Site
24Th St
26Th St
28Th St
Avenue C
Avenue B
East Main Canal
County 11Th St
80
95
0
0.2
0.4
0.8
Miles
Legend
PM-10 Monitoring Site
ADEQ
Arizona Department of Environmental Quality

3.2 Monitoring and Precipitation

Precipitation can affect monitored PM_{10} levels. ADEQ obtained precipitation data for Yuma beginning with 1991 (see Table 3-2 below). As Table 3-2 reveals, annual rainfall for 1991 was below the 30-year average of 2.94 inches, but rose appreciably higher than the average through 1992 to 5.38 inches in 1993. From 1993, the annual precipitation continued to decrease to 0.34 inches in 1996. Rainfall increased to an all time high in 1997 when Yuma received 7.96 inches of rain. Then precipitation levels declined sharply until the year 2000 when the annual precipitation was only 1.62 inches. It increased to 3.48 inches in 2001. Yuma received the least amount of rainfall since 1991 in 2002 when the area only received 0.20 inches of rain for the entire year. Yuma had an usually wet year in 2004 when the total annual precipitation was 7.26 inches.

In spite of the fluctuations in annual precipitation, the Yuma area has experienced only one exceedance of the NAAQS, which does not count as a violation.

Table 3-2. Yuma Annual Precipitation, 1991 – 2004

	1991	1992	1993	1994	1995	1996	1997	1998
JAN	0.13	0.27	1.88	0.02	0.48	0.00	0.00	0.02
FEB	0.20	0.73	1.13	0.29	0.05	0.10	0.00	0.89
MAR	0.57	1.38	0.34	0.13	0.26	0.01	0.00	0.43
APR	0.00	0.13	0.00	0.00	0.17	0.00	0.00	0.02
MAY	0.00	0.27	0.01	0.28	0.00	0.00	0.00	0.01
JUN	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00
JUL	0.00	0.00	0.00	0.00	0.20	0.00	0.32	0.06
AUG	0.01	0.23	0.07	0.06	0.00	0.18	0.00	0.32
SEP	0.12	0.00	0.02	2.07	0.03	0.02	5.37	1.84
OCT	0.13	0.00	0.86	0.00	0.00	0.03	0.14	0.00
NOV	0.06	0.00	1.07	0.01	0.03	0.00	0.00	0.04
DEC	0.62	1.70	0.00	1.35	0.00	0.00	1.96	0.19
TOTAL	1.84	4.71	5.38	4.21	1.22	0.34	7.96	3.82

	1999	2000	2001	2002	2003	2004	Monthly Average
JAN	0.00	0.00	0.42	0.00	0.00	0.28	0.25
FEB	0.42	0.07	0.69	0.00	1.49	0.38	0.46
MAR	0.00	0.37	1.83	0.01	0.35	0.35	0.43
APR	1.19	0.00	0.12	0.00	0.04	0.03	0.12
MAY	0.00	0.00	0.00	0.00	0.00	0.00	0.04
JUN	0.03	0.00	0.00	0.00	0.00	0.00	0.01
JUL	0.36	0.00	0.18	0.00	0.59	0.00	0.12
AUG	0.04	1.15	0.10	0.00	0.51	0.98	0.26
SEP	0.20	0.00	0.00	0.08	0.18	1.07	0.79
OCT	0.00	0.03	0.12	0.09	0.00	1.88	0.23
NOV	0.00	0.00	0.01	0.02	0.41	0.47	0.15
DEC	0.00	0.00	0.01	0.00	0.03	1.82	0.55
TOTAL	2.24	1.62	3.48	0.2	0.44	7.26	0.28

SOURCE: Western Regional Climate Center, 2005

3.3 Monitoring Data -- Yuma PM_{10} Concentrations in 1991 – 2004

Table 3-3 contains monitoring data for the Yuma area for 1991 to 2004. The 24-hour standard was exceeded at the Juvenile Center Monitoring Site twice in 1991 (229 and 188 $\mu g/m^3$) and once in 2002 (170 ug/m^3). The exceedances in 1991 were noteworthy because the Juvenile Center Monitoring Site was representative of the valley (lowest elevation inhabited area) and the active farming area. The annual standard has not been exceeded since 1990. Figure 3.2 is a diagram depicting the annual 24-hour highest and 2nd 24-hour highest PM_{10} concentrations in Yuma.

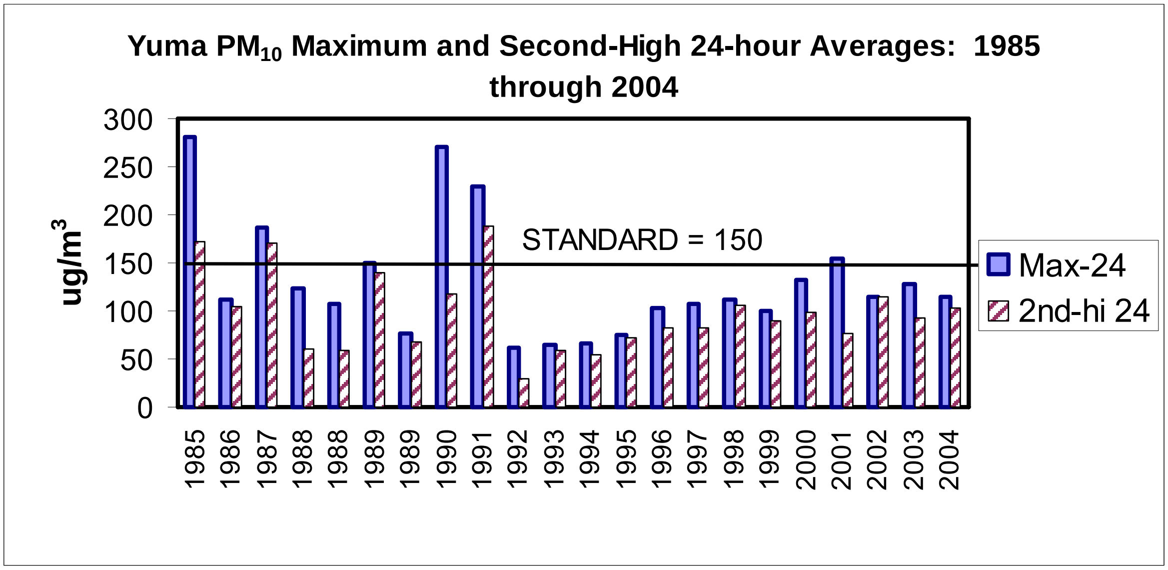
The exceedance of the 24-hr standard that occurred on August 18, 2002, was due to wind-generated dust event. An unusually large and intense thunderstorm developed in east-central Sonora, Mexico. By evening the thunderstorm had moved to the northwest through Yuma, producing sustained winds in excess of 25 miles per hour with gusts up to 45 miles per hour. Due to the high wind speeds, elevated concentrations of PM_{10} were experienced in Yuma. In the Imperial Valley, California and Baja California, Mexico, the average PM_{10} concentrations had values two to four times higher than those in Yuma. Other monitoring sites in the vicinity showed elevated concentrations as high as 700 ug/m^3 on a 24-hour basis.

Table 3-3. PM_{10} Data Summary for the Yuma Juvenile Center Monitor, 1991 – 2004

Year	24-hour High (ug/m^3)[1]	24-hour 2nd High (ug/m^3)	Number of Exceedances of 24-hour Standard	Annual Average (ug/m^3)[2]	Number of Exceedances of Annual Standard	Number of Samples
1991	229	188	2	48	0	48
1992	62	60	0	29	0	52
1993	65	59	0	31	0	47
1994	66	54	0	32	0	37
1995	75	72	0	35	0	47
1996	103	83	0	36	0	40
1997	108	83	0	36	0	34
1998	112	106	0	39	0	58
1999	100	90	0	37	0	56
2000	132	99	0	42.3	0	43
2001	150	77	0	40.6	0	27
2002	170[3]	125	0[3]	47.1	0	53
2003	127	93	0	38.0	0	58
2004	125	125	0	45.2	0	58

[1]24-hour average standard is 150 ug/m^3.
[2]Annual average standard is 50 ug/m^3.
[3]EPA concurred with the data being flagged, and a Natural Events Action Plan was submitted to EPA on February 17, 2004. A Natural Events Action Plan Implementation Report was submitted on August 17, 2005. Through these actions the 170 ug/m^3 was exempted; it does not appear in Figure 3-2.
SOURCE: Air Quality Division, Assessment Section, 2005

Figure 3-2. Annual High and 2nd-High 24-Hour PM_{10} Concentrations in Yuma



SOURCE: Air Quality Division, Assessment Section, 2005

PM_{10} concentrations reported at the Juvenile Center monitoring site between 2000 and 2004, showed one exceedance of the 24-hour PM_{10} NAAQS (see Table 3.3), caused by a high wind event. However, according to EPA's Natural Events Policy (NEP), this measurement does not count as a violation. Consequently, the three-year average number of exceedances was less than 1.0, which indicates Yuma attained the 24-hour PM_{10} NAAQS. Review of the annual standard for calendar years 2002, 2003, and 2004 reveals that the 3-year annual average was 43.4 ug/m^3. The design value is 87 percent of the annual standard. Yuma air quality did not violate the annual standard for the three-year period from 2002 through 2004. Thus, the Yuma area attained the annual PM_{10} NAAQS.

Based on the most recent three years of air quality data, the 24-hour average design value for the Yuma area is 127 ug/m^3. The design value is 85 percent of the 24-hour standard. This plan demonstrates that the control measures modeled to reduce the 24-hour design value will concomitantly reduce the annual design value.

The attainment demonstration was modeled for seven design dates in 1999, with concentrations ranging from 19 to 102 ug/m^3. ADEQ believes that the control measures modeled to reduce the 24-hour design value will concomitantly reduce the annual design value.

Table 3.4 presents summary monitoring data for the Yuma Nonattainment Area for the 2002-2004 timeframe.

Table 3-4. 2002 - 2004 PM $_{10}$ SUMMARY STATISTICS FOR THE YUMA NONATTAINMENT AREA

PM_{10} Concentrations are for Standard Conditions and are in ug/m^3

2002			2003			2004		
Date	Original	Duplicate	Date	Original	Duplicate	Date	Original	Duplicate
			12/29/03	0[a]		12/23/04	52	37
						12/29/04	23	23
Average Q1	53.8	<75%		30.9			32.2	
Average Q2	60.6	67.5		45.0			61.8	
Average Q3	38.3	<75%		33.8			55.4	
Average Q4	35.7			42.4			31.6	
Average (year)	47.1			38.0			45.2	
Std. Dev.	29.87	43.77		21.87			30.72	
N Samples	53	24		58			58	
Minimum	2	17		10			2	
Maximum	125	212		127			125	90
2nd high	115	116		93			125	66
3rd high	113	111		80			125	59
4th high	111	111		71			125	57
5th high	101	96		65			114	55

[a] The December 29, 2003 value of 0 was set to "no data". It's unreasonable to suppose the PM_{10} concentrations averaged for 24 hours in southwest Arizona would be lower than 5 ug/m^3. Consequently, the zero value was set to "no data".

No collocated samples were taken from 8/6/2002 through 7/1/2004.

SOURCE: Yuma Maintenance Plan Technical Support Document Demonstration of Attainment, January 25, 2005

4.0 YUMA AREA EMISSIONS INVENTORY

In order to develop control measures for the sources of PM_{10} in the Yuma Valley, ADEQ had to identify the significant sources of PM_{10} in the Yuma area. This chapter describes the local data and emission estimation methods used to develop 1999 and 2016 PM_{10} emission estimates for Yuma.

E. H. Pechan & Associates Inc. (Pechan), a consulting firm, was hired by ADEQ to develop the PM_{10} source inventory for Yuma[14]. The starting point for the 1999 inventory preparation was Version 1.0 of EPA's National Emissions Inventory (NEI), which contains PM_{10} emission estimates for Yuma County. The projection year of 2016 was selected to meet the EPA requirement that there be a maintenance plan demonstrating that the PM_{10} NAAQS will still be met 10 years after the area is redesignated as an attainment area by EPA.

ADEQ staff made some revisions and additions to the contractor's inventory. The emission estimates presented in this chapter reflect these changes. For a full description of the changes, see Appendix F of the Technical Support Document.

All emission estimates discussed in this chapter are for the entire Yuma Study Area, which includes the nonattainment area, portions of Imperial County, California, and Baja California Norte, Mexico (Figure 4-1).

4.1 Wind-blown Dust

Wind-blown PM_{10} emissions were calculated for the following land use categories: alluvial plain and channels, agricultural crop lands, agricultural unpaved roads, native desert, urban disturbed areas, and miscellaneous disturbed areas (e.g., construction areas outside the City of Yuma). Emissions for the Imperial sand dunes were also assessed. No winds exceeding 30 mph were recorded by the Yuma Valley meteorological station in 1999. Hence, 1999 emissions for sand dunes were assumed to be negligible.

For agricultural lands, it was assumed that PM_{10} emissions are negligible during seasons when crops are present. Hence, emissions were only estimated during seasons when agricultural tilling occurs.

Table 4-1 provides Yuma Study Area acreage estimates for the land uses of interest (Sedlacek, 2002), as well as the emission factor types that were used to estimate PM_{10} emissions. ADEQ developed acreage estimates for the various types of land use with input from stakeholders. Hence, emission estimates were developed for the entire Yuma Study Area, not just Yuma County. Fallow agricultural acreage by season was assumed to be the same in the Imperial County and Mexico portions of the Study

[14] The complete inventory is presented in Appendix A of the Yuma Maintenance Plan Technical Support Document.

Area. For unpaved agricultural roads, ADEQ sampled several areas throughout the Study Area from satellite imagery to derive a factor (0.0815) to estimate the portion of agricultural land that was unpaved roads versus crop land. See Comment 2 and Response in Section 8.2 of Maintenance Plan and Appendix F to the TSD regarding subsequent revisions to Table 4-2 and Table 4-3.

A specific land use category for Urban Disturbed Areas (Code 295) was created to estimate emissions within the urbanized portions of the City of Yuma. This specific category allowed for more accurate characterization of the reductions in emissions associated with the 2013 (the original out-year for the maintenance period) reduction in disturbed area acres within the City of Yuma. This same 2013 reduction in disturbed area was assumed to be representative of 2016.

Figure 4-1. Yuma Study Area

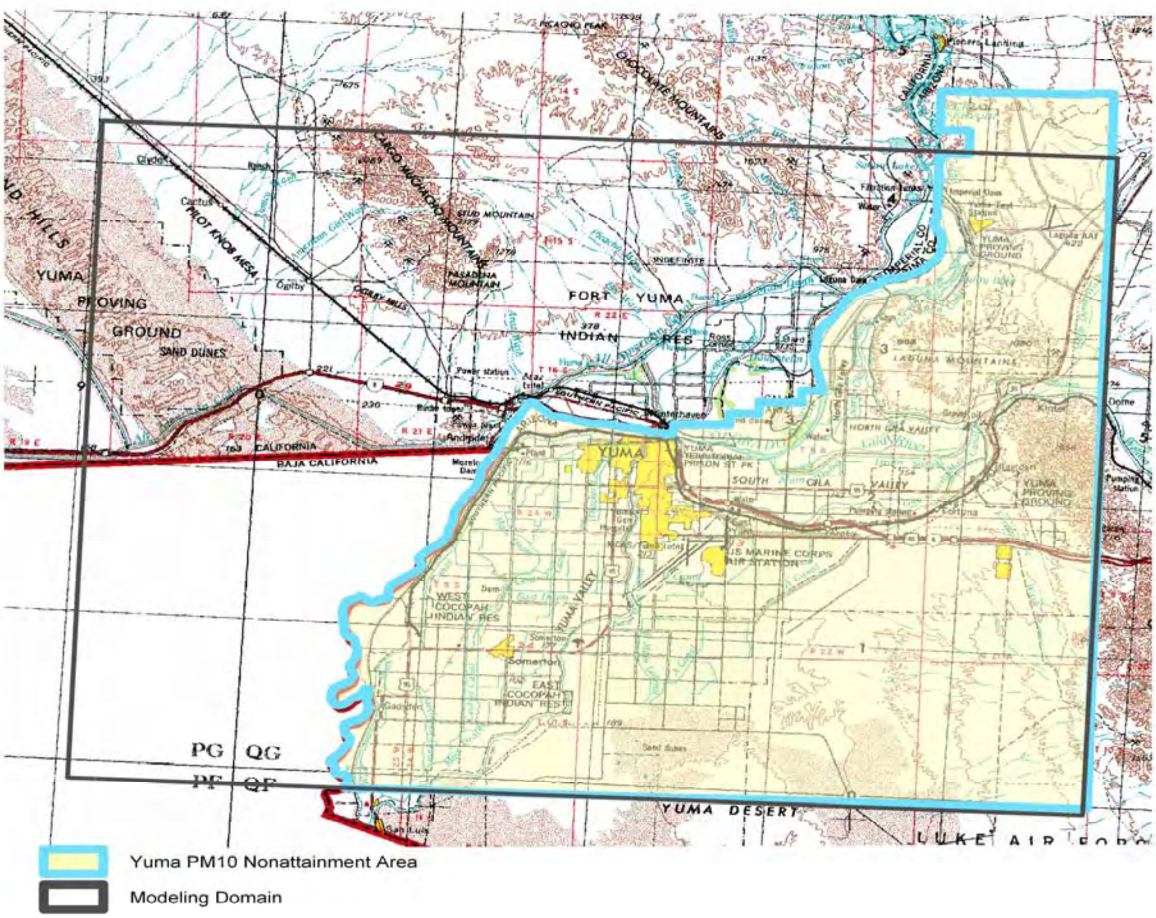


Table 4-1. 1999 Yuma Study Area Acreage Estimates by Land Use Category and Emission Factor Type

Land Use Category	Land Use Code	Acres	Emission Factor Type
Alluvial Plain and Channels	440	141,227	Stabilized Land
Native Desert	390	74,252	Native Desert
Fallow Agricultural Fields	260	18,100[15]	Disturbed Vacant
Unpaved Ag Roads	260	3,1683	Disturbed Vacant
Urban Disturbed Areas	295	4,125	Disturbed Vacant
Miscellaneous Disturbed Areas	290	25,770	Disturbed Vacant
SOURCE: E. H. Pechan and Associates, Inc., 2004			

Table 4-2 contains the 1999 emission estimates for windblown dust for the Yuma Study Area. For native and stabilized lands, emissions are calculated using the number of wind events. This method is based on the assumption that after a short period of high winds on native and stabilized lands, most of the dust capable of being entrained by the wind has already been removed (i.e., the limited reservoir theory). Table 4-2 shows that the highest PM_{10} emissions in 1999 in the Yuma area occurred during the winter season with over 56,000 tons of emissions. Emissions during the fall followed at over 41,000 tons. Dust emissions during the spring of 1999 amounted to over 25,000 tons. Emissions of PM_{10} were the lowest during the summer season at around 6,800 tons.

One aspect of the windblown dust inventory deserves some further explanation: the amount of fallow agricultural fields. As the footnote below explains, this acreage has been reduced by 90% from the contractor's original estimate. What follows are some materials that support that reduction.

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[15] The corrected number of fallow (vacant) agricultural acres in the Yuma Nonattainment Area is 14,000 and in the Yuma Study Area 18,100. The estimate of 181,000 acres for fallow agricultural land comes directly from the contractor's emission inventory report, reprinted in the Technical Support Document as Appendix A. On page 7 of the report, the authors state that because "vacant agricultural land varies by season, the total acreage of agricultural land was multiplied by the following percentages: fall = 35%, winter = 40%, spring = 10%, and summer = 10%. The windblown emissions from this acreage went into the air quality model.

In later discussions with the Yuma farming community, it became obvious that this estimate was several times too large. Based on Yuma area farming practices, this estimate was reduced by 90%, which yielded a "vacant (or fallow) field acreage" of 14,000 acres in the nonattainment area on an annual basis. More discussion of this subject can be found in Appendix C in the Technical Support Document. The over estimation of windblown emissions based on the 181,000 acres contributed to the model's over estimation of measured particulates concentrations on March 31, 1999. But because it was an over estimate, and because compliance with the standards was demonstrated, it is not necessary to redo the air quality modeling.

[3]Revised according the Farm Service Agency that only 2.0% of all ag land is roads, not 8.5%. See Appendix F of the TSD.

Yuma farming has a unique cropping system that is capable of producing over 225 different crops on a year round basis. Year round crop production of the 74,000 acres in the PM_{10} nonattainment area includes 40,000 acres of permanent crops. The remaining acreage is double cropped and is capable of producing as much as 60,000 harvested acres of produce and grain. The vegetable and melon growing season ranges from 60 to 90 days[1] with a rotational crop such as Sudan grass, cotton, wheat, safflower or corn being planted after vegetables and melons are harvested. The practice of double and triple cropping the fields in Yuma has an economical advantage, yielding $10,000 to $30,000 per acre, but equally important is the necessity to maintain good soil conditions in the area. With the extreme heat in Arizona, low organic matter in the soil and salts surfacing from evaporation, fallow cropland in the Yuma area is a severe detriment, not a benefit, to healthy crop production. The long growing season and the fact that all crops in the Yuma area are irrigated and not influenced by rainfall as in other rain-dependent states allows for the opportunity to double and triple crop making this practice economically competitive and accounts for a significant part of the total harvested acres reported to the Farm Service Agency office in Yuma County. The planting and harvesting dates, shown below, confirm that the estimate of ten days of being fallow per field per year is a sound one. It is this ten-day estimate, provided by the Yuma farming community in 2005, that, when compared with the contractor's estimate of from 10 to 45% being fallow depending on the season, results in the 90% reduction.

Usual Planting & Harvesting Dates

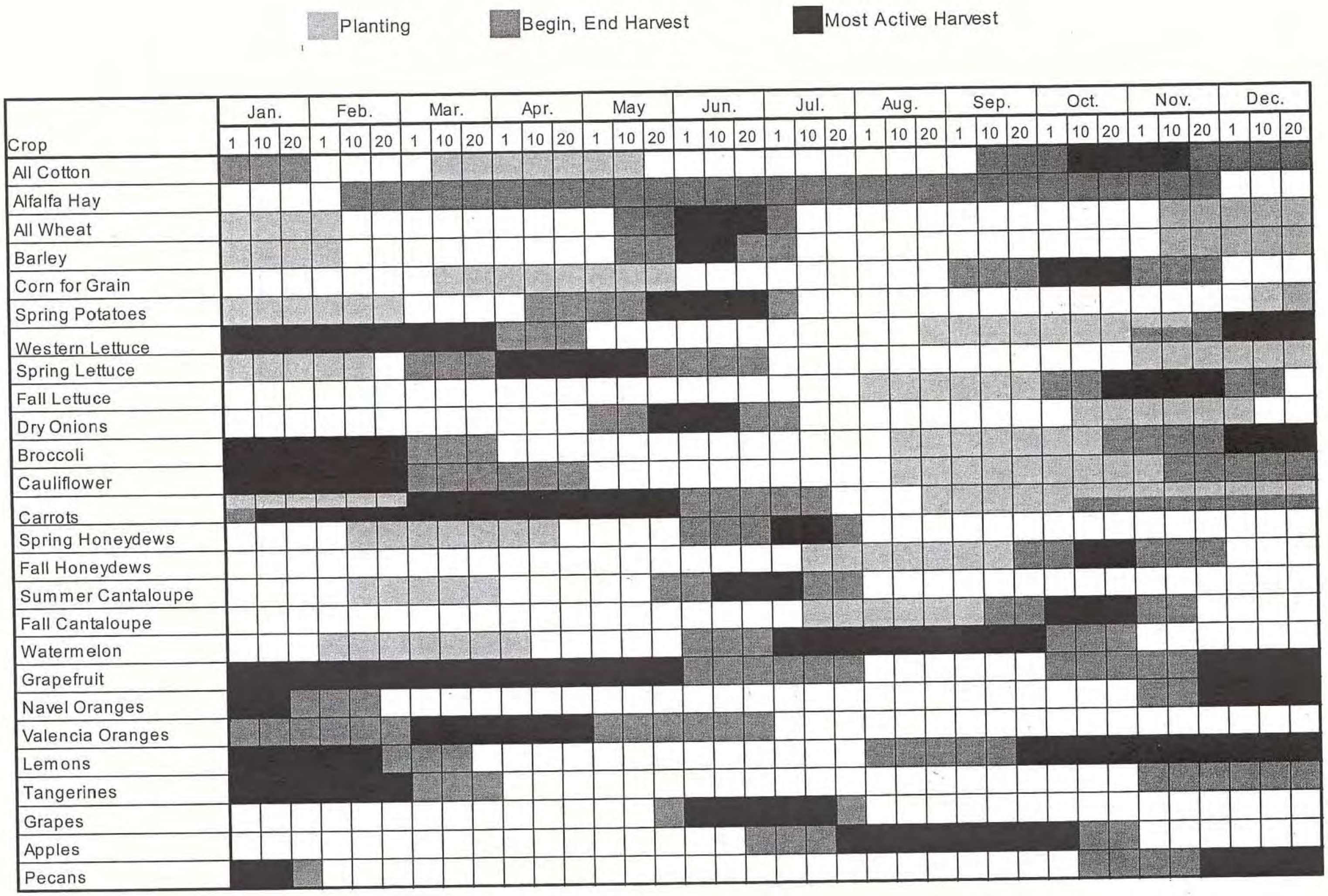


Table 4-2. 1999 Yuma Study Area PM_{10} Emission Estimates for Windblown Dust

		Emissions by Season (tons)				
Land Use Category	Acres	Fall	Winter	Spring	Summer	Total Annual (PM_{10} tons)
Alluvial Plain and Channels	**141,227**	**463**	**926**	**771**	**356**	**2,517**
Native Desert	**74,252**	**191**	**191**	**0**	**0**	**382**
Fallow Agricultural Fields	**18,100**	**2,346**	**3,363**	**693**	**181**	**6,584**
Unpaved Agricultural Roads	**3,168**	**1,174**	**1,473**	**1,215**	**317**	**4,179**
Urban Disturbed Areas	**4,125**	**1,529**	**1,918**	**1,582**	**413**	**5,442**
Miscellaneous Disturbed Areas	**25,770**	**9,554**	**11,981**	**9,883**	**2,578**	**33,996**
	Totals	15,257	19,852	14,144	3,845	53,100

SOURCE: E. H. Pechan and Associates, Inc., 2004

Please refer to Appendix C of the Yuma Maintenance Plan TSD for more information.

Emission estimates for 2016 are provided in Table 4-3. It was assumed that the winds in 2016 would be similar to those observed in 1999. The only significant change in the activity data (acreage estimates) between 1999 and 2016 was the reduction of urban disturbed acreage; hence, the emission estimates for the entire Study Area are very similar. A small amount of agricultural land is lost to urban development in 2016.

Table 4-3. 2016 Yuma Study Area PM_{10} Emission Estimates for Windblown Dust

		Emissions by Season (tons)				
Land Use Category	**Acres**	**Fall**	**Winter**	**Spring**	**Summer**	**Total Annual (PM_{10} tons)**
Alluvial Plain and Channels	**141,227**	**463**	**926**	**771**	**356**	**2,517**
Native Desert	**74,252**	**191**	**191**	**0**	**0**	**382**
Fallow Agricultural Fields	**17,905**	**2,323**	**3,330**	**687**	**179**	**6,519**
Unpaved Agricultural Roads	**3,168**	**1,174**	**1,473**	**1,215**	**317**	**4,179**
Urban Disturbed Areas	**2,290**	**849**	**1,065**	**878**	**229**	**3,021**
Miscellaneous Disturbed Areas	**25,770**	**9,554**	**11,981**	**9,883**	**2,578**	**33,996**
Totals		14,554	18,966	13,434	3,659	50,614

Please refer to Appendix C of the Yuma Maintenance Plan TSD for more information.

SOURCE: E. H. Pechan and Associates, Inc., 2004

In developing emissions for the unpaved roads in the Yuma area, unpaved road emissions were broken out into two subcategories: emissions from unpaved public roads and emissions from agricultural roads. The emissions for unpaved public roads is assumed to be 15% of the total (i.e. 15% of the unpaved road travel occurs on unpaved public roads), while the remaining 85% of emissions occur from agricultural roads (Ramos, 2003).
Vehicle miles traveled (VMT) data and the mean vehicle speed were obtained from the PM_{10} emissions analysis conducted as part of the Yuma Metropolitan Planning Organization (YMPO) Model and Air Quality Conformity Analysis project. The report indicates that the 1999 unpaved road daily VMT, calculated using TransCAD GIS-based modeling software, is 98,864 miles (Lima & Associates, 2000). The projected daily unpaved road VMT for 2016 is 64,240 miles. This value was estimated by calculating the annual growth rate between 2013 and 2025 unpaved road VMT projections (Lima & Associates, 2002). This annual growth rate of 6.1 percent per year was then used to estimate three additional years of growth from 2013.

EPA's MOBILE6.1 model was used to obtain the reentrained road dust, brake wear, and tire wear portions of the paved road emission factors (EPA, 1995) in the Yuma Study Area. The paved road reentrained dust emissions came from EPA's AP-42 equation, which included the subtraction of the constant for the 1980s exhaust portion. These emission factors are shown in Table 4-4, along with the tire wear emission factor. This value does not change by road type or year. MOBILE6.1, another EPA model, was used to calculate 1999 and 2016 exhaust emission factors (EPA, 2002). The MOBILE6.1 exhaust emission factors account for Tier 2 emission standards and 2007 heavy duty emission standards that are not incorporated in PART5. These exhaust emission factors are shown in Table 4-4.

Daily VMT estimates were obtained from the PM_{10} emissions analysis prepared by Lima & Associates for the Arizona Department of Transportation (ADOT) and the YMPO (Lima & Associates, 2000). VMT for each roadway type was estimated using TransCAD GIS based modeling software. Lima & Associates projected 2013 and 2025 daily VMT on paved roads (Lima & Associates, 2002). Daily VMT estimates were not available for 2016 for this analysis. Therefore, the average annual growth rate was calculated for each road type from 2013 to 2025. Three years of growth at this annual growth rate were then applied to the 2013 VMT by road type to estimate 2016 average daily VMT on paved roads. The 1999, 2013, and 2025 VMT, as well as the calculated annual growth rates between 2013 and 2025, and the estimated 2016 VMT are all shown in Table 4-5.

Table 4-4. 1999 and 2016 PM_{10} Paved Road Emission Factors by Road Type

Roadway Type	Speed(mph)	Silt Loading (g/m^2)	AP-42 Equation, 1999 & 2016 (includes Reentrained Dust, Brake Wear, Tire Wear, and Exhaust)	PART5 1999 and 2016 Paved Road Reen-trained Dust plus Brake Wear Emission Factor (g/mi)	PART5 1999 and 2016 Tire Wear Emission Factor (g/mi)	1999 MOBILE6.1 PM_{10} Exhaust Emission Factor (g/mi)	2016 MOBILE6.1 PM_{10} Exhaust Emission Factor (g/mi)	1999 Total Paved Road PM_{10} Emission Factor (includes Reentrained Dust, Tire Wear, Brake Wear, and Exhaust)	2016 Total Paved Road PM_{10} Emission Factor (includes Reentrained Dust, Tire Wear, Brake Wear, and Exhaust)
Interstate	55	0.04	0.57	0.37	0.009	0.064	0.011	0.443	0.390
Principal Arterials	42	0.3	2.13	1.92	0.009	0.064	0.011	1.993	1.940
Minor Arterials	40	0.3	2.13	1.92	0.009	0.064	0.011	1.993	1.940
Rural Major Collectors	45	0.7	3.69	3.49	0.009	0.064	0.011	3.563	3.510
Rural Minor Collectors	46	0.7	3.69	3.49	0.009	0.064	0.011	3.563	3.510
Urban Collectors	35	0.24	1.84	1.64	0.009	0.064	0.011	1.713	1.660
Local Roads	35	0.85	4.19	3.98	0.009	0.065	0.011	4.054	4.000
Interstate Ramps	35	0.04	0.57	0.37	0.009	0.064	0.011	0.443	0.390
Local	20	0.85	4.19	3.98	0.009	0.065	0.011	4.054	4.000

NOTES: Emission factors are in grams per mile.

SOURCE: E. H. Pechan and Associates, Inc., 2004

As with unpaved roads, the paved road reentrained dust emission factors were corrected for the effects of precipitation. Only the fugitive dust portion of the emission factor was adjusted for precipitation effects. No adjustments were applied to the brake wear, tire wear, or exhaust portions of the emission factors.

Table 4-5. 1999 and 2016 Daily VMT by Road Type

Road Type	1999 Daily VMT (miles per day)	2013 Daily VMT (miles per day)	2025 Daily VMT (miles per day)	Average Annual Growth Rate from 2013 to 2025	Estimated 2016 Daily VMT (miles per day)
Interstate	**541,163**	**866,379**	**986,872**	**1.09%**	**895,048**
Principal Arterials	**860,715**	**1,564,166**	**1,768,187**	**1.03%**	**1,612,851**
Minor Arterials	**672,408**	**1,137,824**	**1,443,793**	**2.00%**	**1,207,626**
Rural Major Collectors	**91,129**	**198,520**	**289,087**	**3.18%**	**218,077**
Rural Minor Collectors	**448,640**	**870,923**	**1,028,207**	**1.39%**	**907,831**
Urban Collectors	**139,709**	**232,904**	**271,676**	**1.29%**	**242,045**
Local Roads	**4,841**	**17,387**	**21,204**	**1.67%**	**18,271**
Interstate Ramps	**50,581**	**84,437**	**94,825**	**0.97%**	**86,922**
Local Paved	**889,680**	**1,361,490**	**1,678,386**	**1.76%**	**1,434,610**
Total	3,698,866	6,334,030	7,582,237		6,623,281

SOURCES: The 1999 Daily VMT estimates are from Lima & Associates, 2000. The 2013 and 2025 Daily VMT estimates are from Lima & Associates, 2002.

4.1.1 Road Construction Emissions

Construction emissions are estimated using two basic construction parameters, the acres of land disturbed by the construction activity and the duration of the activity. Data on the actual acres disturbed by road construction are generally not available, so a surrogate is used. The 1999 NEI emission estimation methods for road construction use the following miles to acres conversions by roadway type:

Interstate, urban and rural; Other arterial, urban – 15.2 acres/mile
Other arterial, rural – 12.7 acres/mile
Collectors, urban – 9.8 acres/mile

Collectors, rural – 7.9 acres/mile

The projected number of miles of highway constructed in 1999 and 2013 were provided by local officials. Activity in 2016 is assumed to be equivalent to the 2013 projected activity (see Table 4-6). The type of roadways constructed was not available; therefore, 9.8 acres/mile was assumed for all roads.

Table 4-6. 1999 and 2016 Miles of Roadway Constructed and PM_{10} Emissions

Location	1999 Miles of Roadway Constructed	1999 Emissions (tons)	2016 Miles of Roadway Constructed	2016 Emissions (tons)
Somerton	**2.52**	**184**	**0**	**0**
City of Yuma	**7.2**	**527**	**11.1**	**812**
Yuma Co.	**1.9**	**139**	**3.6**	**263**
ADOT	**0.7**	**51**	**4.8**	**351**
Total		**901**		**1427**

SOURCE: E. H. Pechan and Associates, Inc., 2004

Emissions were calculated using the total acres disturbed, the PM_{10} emission factor of 0.42 tons/acre/month, and the activity duration, estimated to be 12 months. Adjustments were made to the PM_{10} emissions to account for conditions in Yuma including correction parameters for soil moisture level and silt content (MRI, 1999).

Soil moisture levels were estimated using precipitation-evaporation values from Thornthwaite's PE Index. The PE value for Yuma County is 6. A silt content value of 40 percent was used. This value was used to calculate 1999 NEI emissions for Yuma County and was determined by comparing the U.S. Department of Agriculture surface soil map with the county map. See Appendix F for a revision to these road construction estimates.

All of these emissions have been recalculated by ADEQ staff and are explained in Appendix F of the TSD.

4.1.2 General Building Construction Emissions

This emissions category includes PM_{10} emissions from residential building (housing) construction and commercial building construction. Housing construction PM_{10} emissions were calculated using an emission factor of 0.032 tons PM_{10}/acre/month, number of housing units constructed, a units-to-acres conversion factor, and the duration of construction activity. The duration of construction activity is assumed to be 6 months (MRI, 1999).

Apartment construction emissions were computed separately using an emission factor that is more representative of emissions from apartment building construction (0.11 tons PM_{10}/acre/month). A 12-month duration is assumed for apartment construction. The same emission factor and duration were used for warehouse construction.

The total acres disturbed by construction are estimated by applying conversion factors to the housing start data for each category as follows:

Single family - 1/4 acre/building
Two families - 1/3 acre/building
Apartment - ½ acre/building or 1/20 acre/unit

These conversion factors were used unless they were larger than 1999 average lot sizes reported by local officials. Average lot size was used for all Yuma County buildings and City of Yuma single family houses and duplexes. The warehouse average lot size of 7 acres provided by the City of Yuma seemed excessively large, and there were no acres per building conversion factors available for warehouses. Therefore, the average warehouse lot size provided by Yuma County was also used for the 8 warehouses constructed in the City of Yuma.

The number of single-family, two-family, and apartment buildings and warehouses constructed in 1999 and 2013 projections were provided by Somerton, Yuma, and Yuma County officials. The data provided by Somerton combined single-family and two-family data; therefore, all units were assumed to be single-family buildings. The number of single family houses, duplexes, and warehouses constructed in 1999 and 2013 projections and the acre/unit used for each is shown in Table 4-7. Activity in the 2016 projection year is assumed to be the same as projected for 2013. The 1999 and 2016 emission estimates in tons per year (tpy) for building construction are given in Table 4-8.

Table 4-7. 1999 and 2013 Housing Starts and Acres/Unit Conversions

		1999		2013	
	Unit Type	No. of Units	Acres/Unit	No. of Units	Acres/Unit
Yuma Co.	**single family**	**370**	**0.25**	**370**	**0.25**
	warehouses	**8**	**1.30**	**8**	**1.30**
City of Yuma	**single family**	**251**	**0.184**	**1533**	**0.184**
	Duplex	**2**	**0.184**	**6**	**0.184**
	apartment	**44**	**0.05**	**111**	**0.05**
	warehouses	**8**	**1.30**	**7**	**1.30**
Somerton	**single family**	**393**	**0.25**	**393**	**0.25**
	apartment	**84**	**0.05**	**84**	**0.05**

SOURCE: E. H. Pechan and Associates, Inc., 2004

Table 4-8. 1999 and 2016 PM_{10} Emission Estimates for Building Construction

Area	Unit Type	1999 Emissions (tons)	2016 Emissions (tons)
Yuma Co.	**single family**	197	197
	warehouses	263	263
City of Yuma	**single family**	98	600
	duplex	1	2
	apartment	32	163
	warehouses	263	231
Somerton	**single family**	58	58
	apartment	44	44
Totals		955	1558

SOURCE: E. H. Pechan and Associates, Inc., 2004; See Appendix F for an explanation of these revised emission estimates.

4.2 Aircraft Emissions

The basic method for estimating emissions for this category involves determining aircraft fleet make-up and level of activity and this is matched with the appropriate emission factors by aircraft type to estimate daily or annual emissions. Aircraft emission estimates focus on emissions that occur close enough to the ground to affect ground-level concentrations. Aircraft operations within this layer are defined as landing and takeoff (LTO) cycle. The five specific operating modes in an LTO are:

Approach
Taxi/idle-in
Taxi/idle-out
Takeoff
Climb-out

The following PM_{10} emission factors were used for calculating emissions (EPA, 1992):

Air Taxi: 0.60333 pounds/LTO
Military Aircraft: 0.60333 pounds/LTO

Air taxi refers to small aircraft used for scheduled service carrying passengers and/or freight.

LTO information was provided by the U.S. Border Patrol, the Marine Corps Air Station, the Yuma Proving Ground, and Yuma International Airport, shown in Table 4-9. The number of flights per day is expected to decrease at Yuma International Airport between 1999 and 2013 due to a decrease in the number of passengers to the

Yuma market and the subsequent increased fares to Yuma. The 2013 estimates provided by the sources above are assumed to be representative of 2016 activity.

Table 4-9. 1999 and 2016 LTO Data and Emission Estimates for Yuma Airports

Airport	1999 Daily LTOs	1999 Emissions (tons)	2016 Daily LTOs	2016 Emissions (tons)
U.S. Border Patrol	**2**	**0.22**	**6**	**0.66**
Marine Corp Air Station	**60**	**6.60**	**69**	**7.60**
Yuma Proving Ground	**54**	**5.95**	**54**	**5.95**
Yuma Intl. Airport	**25**	**2.75**	**20**	**2.20**
Total		15.5		16.4

SOURCE: E. H. Pechan and Associates, Inc., 2004

4.2.1 Unpaved Airstrips

PM_{10} emissions from unpaved airstrips were estimated using the same equation as was used for unpaved roads. The soil silt content and moisture content were assumed to be 3 percent and 1 percent, respectively. An average speed of 40 mph was used, and the length of one LTO was assumed to be 1 mile. The number of flights per week for the two unpaved airstrips in the Yuma nonattainment area, shown in Table 4-10, was provided by local officials. The number of LTOs estimated by these officials for 2013 is assumed to be representative of activity in 2016.

Table 4-10. 1999 and 2016 LTO Data and Emissions for Unpaved Airstrips

	1999			2016		
Airstrip	Flights per Week	Average Annual LTOs	Emission (lbs)	Flights per Week	Average Annual LTOs	Emission (lbs)
Somerton	**7-10**	**442**	**202**	**15**	**780**	**356**
Pierce Aviation	**70-80**	**3,900**	**1,781**	**70-80**	**3,900**	**1,781**
Total		4,342	1,982		4,680	2,137

SOURCE: E. H. Pechan and Associates, Inc., 2004

4.3 Stationary Sources

1999 PM_{10} emissions for 5 categories of stationary sources, shown in Table 4-11, were provided by ADEQ. Emissions for 2016 were calculated by applying growth factors to the 1999 emissions. The growth factors were based on industry sector constant dollar output projections from Regional Economics Model, Inc. (REMI) economic models incorporated into Version 4.0 of the Economic Growth Analysis System (EGAS) (Pechan, 2001). Table 4-12 shows the 1999 and 2016 REMI data for each sector. The growth factors, the ratio of 2016 output to 1999 output, are also shown in Table 4-12. The growth factor for manufacturing stationary sources was calculated by summing the REMI data for REMI sectors 1 (lumber and wood products), 3 (stone, clay, and glass products), 16 (paper and allied products), and 18 (chemical and allied products).

Table 4-11. 1999 and 2016 PM_{10} Stationary Source Emissions

Sector	1999 Emissions (tons)	2016 Emissions (tons)
Support activities for agriculture	**10**	**14**
Utilities	**50**	**73**
Manufacturing	**6**	**11**
National Security	**1**	**1**
Rock Products	**10**	**20**
Total	77	119

SOURCE: E. H. Pechan and Associates, Inc., 2004

Table 4-12. 1999 and 2016 REMI Data and Growth Factors

Sector	REMI Sector	1999 REMI Data	2016 REMI Data	2016 Growth Factor
Support activities for agriculture	**49**	**0.656**	**0.893**	**1.361**
Utilities	**30**	**1.883**	**2.740**	**1.455**
Manufacturing	**1,3,16, and 18**	**3.839**	**10.267**	**1.877**
National Security	**52**	**4.608**	**4.800**	**1.042**
Rock Products	**3**	**1.631**	**3.291**	**2.018**

SOURCE: E. H. Pechan and Associates, Inc., 2004

4.4 Railroad Locomotives

The 1999 NEI estimates that railroad locomotives contribute 17 tpy of PM_{10} in the Yuma Nonattainment Area. Estimation methods are described in the Trends Procedures Document (EPA, 2001a). Future year activity changes affecting emission estimates are based on earnings projections for Railroad Transportation.

In January 1997, EPA proposed draft locomotive emission standards to control emissions of oxides of nitrogen, volatile organic compounds, carbon monoxide, PM, and smoke from newly manufactured and remanufactured diesel-powered locomotives and locomotive engines. In December 1997, EPA promulgated the locomotive emission standards (EPA, 1997). The locomotive standards are to be implemented in three phases, depending on the manufacture date. Tier 0 applies to the remanufacturing of locomotives and locomotive engines manufactured from 1973 through 2001. Tier I applies to the original manufacture and remanufacturing of locomotives and locomotive engines manufactured from 2002 through 2004. Tier II applies to the original manufacture and remanufacturing of locomotives and locomotive engines manufactured in 2005 and later. When fully phased-in by 2040, EPA estimates that the rule will achieve a 46 percent reduction in PM emissions. Emission estimates for 1999 and 2016 are shown in Table 4-13 below.

4.5 Summary of Stationary and Area Source Emissions for the Yuma Area

Table 4-13 summarizes the 1999 and 2016 PM_{10} emissions by source category developed by Pechan and Associates, Inc. for the Yuma area. These source categories are listed in the same order that they appear in this chapter. The emission estimates summarized in Table 4-13 are for the entire Yuma Study Area. In total, 2016 emissions are expected to be at the same level that they were in 1999. The largest PM_{10} emission reductions between 1999 and 2016 come from paving unpaved roads, and through reducing the acreage that is susceptible to windblown dust. These PM_{10} emission reductions are offset by increased PM_{10} emissions resulting from increased travel on paved roads and more road construction occurring in 2016 than in 1999. Agriculture-related PM_{10} emissions are expected to remain steady during the study period.

Table 4-13. Yuma PM_{10} Nonattainment Area Emissions Summary - 1999 and 2016

	1999 Annual Emissions (tons)	2016 Annual Emissions (tons)
Windblown Dust	53,100	50,573
Unpaved Roads - Re-entrained Dust	10,174	5,532
Agricultural Tilling	3,572	3,572
Paved Roads	3,419	5,839
General Building Construction	955	1,558
Road Construction	901	1,427
Lawn & garden	110	180
Stationary Sources	77	119
Agricultural and Prescribed Burning	41	34
Railroad Locomotives	17	15
Agricultural Cultivation and Harvesting	16	16
Light Commercial Vehicles (Nonroad)	13	13
Aircraft	16	16
ATVs	3.6	5.9
Unpaved Airstrips	1	1
Total	72,416	68,901

Categories in bold have been revised; in italics, added to the original inventory. Descriptions of these revisions and additions are in Appendix F of the TSD.

SOURCE: E. H. Pechan and Associates, Inc., 2004

4.6 Mobile Source Emissions Budgets

Mobile sources are also a source of PM_{10} emissions in the Yuma area. Their impact on the air quality of the Yuma area has to be assessed in the context of attaining the PM_{10} NAAQS and complying with the NAAQS throughout the maintenance period. Transportation conformity regulations in 40 CFR Part 93, Subpart A require that mobile source emissions budgets be calculated for the Yuma area. To this end, the Yuma Metropolitan Planning Organization (YMPO) and its contractor, Lima and Associates, Inc., have forecasted mobile source emissions in the Yuma area for 2004, 2008, and the maintenance year of 2016. Since these forecasts were not part of the area source and point source emissions inventory developed by Pechan and Associates, Inc., they are presented here in Tables 4-14, 4-15, and 4-16, respectively.

Table 4-14. Mobile Sources Emissions Data Used in the Calculation of the Mobile Source Emissions Budgets for the Yuma Nonattainment Area for the Year 2004

Facility Type	Daily VMT (miles)	Daily VHT	Modeled Speed	Speed Used	Silt Loading	Total (tons/day)
Interstate	450,868	8,738	51.60	55.00	0.040	0.17
Principal Arterials	972,027	25,688	37.84	42.00	0.040	1.87
Minor Arterials	741,717	22,402	33.11	40.00	0.070	1.42
Rural Major Collectors	51,790	1,188	43.57	45.00	0.240	0.18
Rural Minor Collectors	396,212	9,730	40.72	46.00	0.240	1.38
Urban Collectors	136,550	5,039	27.10	35.00	0.240	.22
Local Roads	5,043	144	34.97	35.00	0.580	.02
Interstate Ramps	43,629	1,440	30.30	35.00	0.040	.02
Local Paved	1,003,951			20.00	0.580	4.0
Local Unpaved	72,281			10.00	0.580	7.8
DAILY TOTAL	3,874,068	74,369				17.12

*The tonnage information is in short tons.

SOURCE: Yuma Metropolitan Planning Organization and Lima and Associates, Inc. 2005

Table 4-15. Mobile Sources Emissions Data Used in the Calculation of the Mobile Source Emissions Budgets for the Yuma Nonattainment Area for the Year 2008

Facility	Daily VMT (miles)	Daily VHT	Modeled Speed	Speed Used	Silt Loading	Total (tons/day)
Interstate	507,964	9,863	51.50	55.00	0.040	0.19
Principal Arterials	1,089,183	28,830	37.78	42.00	0.040	2.10
Minor Arterials	853,125	25,899	32.94	40.00	0.070	1.64
Rural Major Collectors	73,965	1,758	42.17	45.00	0.240	0.26
Rural Minor Collectors	468,916	11,871	39.50	46.00	0.240	1.64
Urban Collectors	156,972	5,792	27.10	35.00	0.240	0.26
Local Roads	5,176	149	34.71	35.00	0.580	0.02
Interstate Ramps	49,491	1,784	27.74	35.00	0.040	0.02
Local Paved	1,165,752			20.00	0.580	4.64
Local Unpaved	76,469			10.00	0.580	8.30
Daily Totals	4,447,013	85,946				19.05

*The tonnage information is in short tons.

SOURCE: Yuma Metropolitan Planning Organization and Lima and Associates, Inc. 2005

Table 4-16. Mobile Sources Emissions Data Used in the Calculation of the Mobile Source Emissions Budgets for the Yuma Nonattainment Area for the Year 2016

Facility	Daily VMT (miles)	Daily VHT	Modeled Speed	Speed Used	Silt Loading	Total (tons/yr)
Interstate	662,471	12,659	52.33	55.00	0.040	0.25
Principal Arterials	1,466,306	41,539	35.30	42.00	0.300	2.82
Minor Arterials	1,007,532	32,696	30.82	40.00	0.300	1.93
Rural Major Collectors	166,904	3,834	43.53	45.00	0.700	0.58
Rural Minor Collectors	870,323	23,261	37.42	46.00	0.700	3.04
Urban Collectors	247,995	8,699	28.51	35.00	0.240	0.41
Local Roads	8,133	232	35.06	35.00	0.850	0.03
Interstate Ramps	63,083	2,206	28.60	35.00	0.040	0.02
Local Paved	1,510,851			20.00	0.850	6.01
Local Unpaved	100,856.76			10.00	0.850	10.95
Daily Totals	6,104,454.76	125,126				26.04

*The tonnage information is in short tons.

SOURCE: Yuma Metropolitan Planning Organization and Lima and Associates, Inc. 2005

The contractor did use the latest AP-42 emission factor equation for reentrained dust, which is given below.

The quantity of particulate emissions from resuspension of loose material on the road surface due to vehicle travel on a dry paved road may be estimated using the following empirical expression:

$$E = k\left(\frac{sL}{2}\right)^{0.65} \times \left(\frac{W}{3}\right)^{1.5} - C \qquad (1)$$

where: E = particulate emission factor (having units matching the units of k),
k = particle size multiplier for particle size range and units of interest (see below),
sL = road surface silt loading (grams per square meter) (g/m^2),
W = average weight (tons) of the vehicles traveling the road, and
C = emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear.

The “C” in the equation above for PM_{10} is 0.2119 grams per mile. When this value is subtracted from emission factors from the earlier equation that incorrectly included C, the result is that the paved road emission factors go down substantially, from 3% to 67 %. The unpaved road emission factors effectively do not change. Because of their magnitude, 250 grams per mile, subtracting 0.2 from 250 does not have a significant effect on emissions.

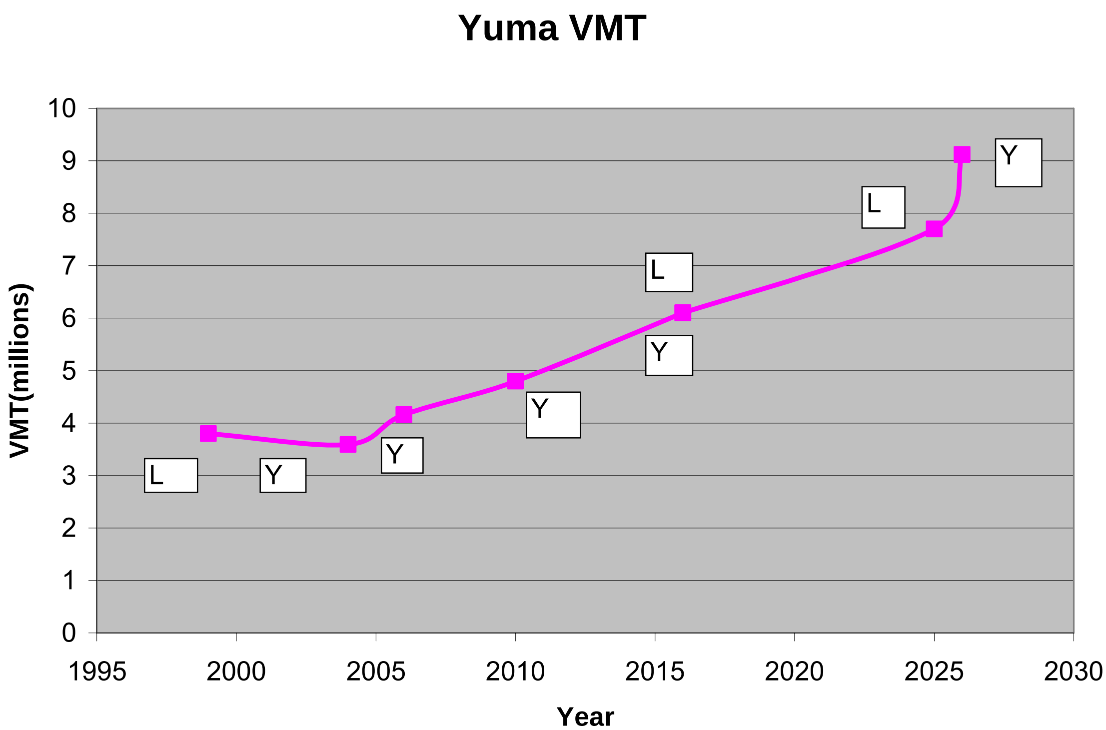
Lima used 1999 vehicle miles traveled (VMT) numbers, the latest available numbers at the time Lima completed its work. ADEQ has compared more recent VMT numbers published by the YMPO in its 2005 Conformity Analysis. As Table 4-17 and Figure 4-2 below demonstrate, the two sets of traffic modeling are similar.

Table 4-17. Vehicle Miles Traveled in Yuma Planning Area

Source	Year	VMT
Lima 2000 - 2002	1999	3.8
YMPO 2005 Conform	2004	3.59
YMPO 2005 Conform	2006	4.16
YMPO 2005 Conform	2010	4.8
Lima 2000 - 2002	2016	6.1
YMPO 2005 Conform	2016	6.1
Lima 2000 - 2002	2025	7.7
YMPO 2005 Conform	2026	9.12

SOURCE: AQD Assessment Section, 2006

Figure 4-2.



SOURCE: AQD Assessment, 2006

Use of 2005 VMT figures does not have a significant emissions impact, and maintenance is still demonstrated.

4.7 Revisions to the Emissions Inventory

Discussed in Appendix F of the Technical Support Document, ADEQ staff made several revisions to the contractor's emissions inventory. Three new categories were added: lawn and garden equipment, all terrain vehicles, and offroad light commercial vehicles. Road and building construction emissions were recalculated. Unpaved road emissions changed slightly. Windblown dust from vacant agricultural fields was reduced 90%. All of these changes are documented in Appendix F and should be consulted for a better understanding of Yuma's emissions.

5.0 MODELING

5.1 Introduction

The Yuma Nonattainment Area's ambient monitoring data have demonstrated attainment since 1991. The area, however, must also demonstrate that the clean air will last ten years into the future, despite the anticipated growth of the Yuma Valley. This demonstration consists of several steps:

- Choose several dates, called design days, from the base year 1999 to study, taking into account a variety of different meteorological conditions and the four seasons of the year (see Yuma Maintenance Plan Technical Support Document (TSD) Section 2.2);

- Build inventories of emissions for the base year 1999 and the future year 2016, and convert these inventories into a numerical format compatible with an air quality model (Yuma Maintenance Plan TSD Section 2.3);

- For each design day, calculate the background PM_{10} concentrations. These are the concentrations that would have occurred had there been no anthropogenic emissions from within the Yuma modeling domain (TSD Section 2.4);

- Simulate the PM_{10} concentrations of the base year with an air quality model. This model provides predicted concentrations based on the emissions and specific meteorological conditions of each design day (TSD Section 2.5); and

- Simulate the PM_{10} concentrations of the future year 2016, with the future year emissions and the base year meteorological conditions (TSD Section 2.6).

A demonstration of attainment is shown for the base and future years when the modeled PM_{10} concentrations for the base-year and the modeled PM_{10} concentrations for 2016 are below the standard (see TSD Section 2.7).

5.2 Modeling Design Days for Base Year

PM_{10} concentrations for the base year 1999 are shown in Table 5-1. Yuma's monitoring in 1999 was done with two collocated samplers. Data from the original sampler were found to be invalid for the second half of the year. The annual average was 37 ug/m^3; the highest 24-hour average was 102 ug/m^3 (standards are 50 ug/m^3 and 150 ug/m^3, respectively). The design days chosen, given in Table 5-2, represent all the seasons and a variety of meteorological conditions.

Table 5-1. Yuma PM_{10} Concentrations for 1999 (24-Hour Averages in ug/m^3)					
Date	**Original**	**Duplicate**	**Date**	**Original**	**Duplicate**
1/6/99	45	45	7/5/99	43	71
1/12/99	55	48	7/11/99	40	44
1/18/99	45	40	7/17/99	19	
1/24/99	35	33	7/23/99		24
1/30/99	35	34	7/29/99		
2/5/99			8/4/99		
2/11/99	19	19	8/10/99		26
2/17/99	61	58	8/16/99		35
2/23/99	28	29	8/22/99		27
3/1/99	64	65	8/28/99		18
3/7/99	28	17	9/3/99		88
3/13/99	38	40	9/9/99		37
3/19/99			9/15/99		38
3/25/99	17	18	9/21/99		34
3/31/99	102	74	9/27/99		28
4/6/99	20	22	10/3/99		31
4/12/99	20	17	10/9/99		67
4/18/99	19	22	10/15/99		47
4/24/99	22	21	10/21/99		43
4/30/99	36	36	10/27/99		37
5/6/99	24	34	11/2/99		65
5/12/99	27	31	11/8/99		32
5/18/99	31	36	11/14/99		46
5/24/99	32	34	11/20/99		50
5/30/99	21	30	11/26/99		54
6/5/99	26	28	12/2/99		15
6/11/99	42	45	12/8/99		46
6/17/99	19	22	12/14/99		35
6/23/99	43	44	12/20/99		19
6/29/99		42	12/26/99		19

SOURCE: Yuma Maintenance Plan TSD, 2006

Table 5-2. PM_{10} Design Days for 1999				
Date	PM_{10} (ug/m^3)		Day of Week	Meteorological Conditions and Emissions
	Original	Duplicate		
1/12/99	55	48	Tuesday	Low Winds, Agricultural Tillage
3/31/99	102	74	Wednesday	High Winds
5/30/99	21	30	Sunday	Low Winds
6/23/99	43	44	Wednesday	Low Winds
7/17/99	19		Saturday	Low Winds
11/8/99		32	Monday	Low Winds
12/8/99		46	Wednesday	Low Winds, Agricultural Tillage

These dates also cover both low and high winds, two of the three highest recorded concentrations, and a wide range of low to moderate concentrations.

5.3 Emissions Inventory

5.3.1 Findings from the Inventory

A complete inventory of PM_{10} emissions for the Yuma area was constructed for the modeling domain shown in Figure 5.1. The PM_{10} emissions inventory for modeling was based on six different dates in 1999. The emissions domain covers 945 square miles (2,464, km^2), with the City of Yuma located near its center. The emissions domain is a rectangle aligned east and west, with 14 grids in the east-west direction and 11 grids in the north-south direction. Each grid is a square 4 kilometers on a side. This emissions inventory domain is also the modeling domain.

Table 5-3 presents the 1999 and 2016 annual PM_{10} emissions by source category. On low-wind days, the dominant source categories are unpaved roads, road construction, agricultural tilling, and reentrained dust from paved roads. Modeling of the high-wind date proved to be unsuccessful and was eventually dropped from the analysis.

Table 5-3. Yuma PM_{10} Emissions for 1999 and 2016			
Source Category	**Annual Tons of PM_{10}**		
	1999	**2016**	**% Change***
Windblown Dust	53,100	50,573	-4.8
Unpaved Roads - Re-entrained Dust	10,174	5,532	-45.6
Agricultural Tilling	3,572	3,572	0.0
Paved Roads	3,419	5,839	70.8
General Building Construction	955	1,558	63.0
Road Construction	901	1,427	58.3
Lawn & garden	110	180	63.0
Stationary Sources	77	119	54.5
Agricultural and Prescribed Burning	41	34	-16.2
Railroad Locomotives	17	15	-11.8
Agricultural Cultivation and Harvesting	16	16	0.0
Light Commercial Vehicles (Nonroad)	13	13	0.0
Aircraft	16	16	5.8
ATVs	3.6	5.9	63.0
Unpaved Airstrips	1	1	10.0
Total	72,416	68,901	-4.9

SOURCE: Yuma Maintenance Plan TSD, 2006

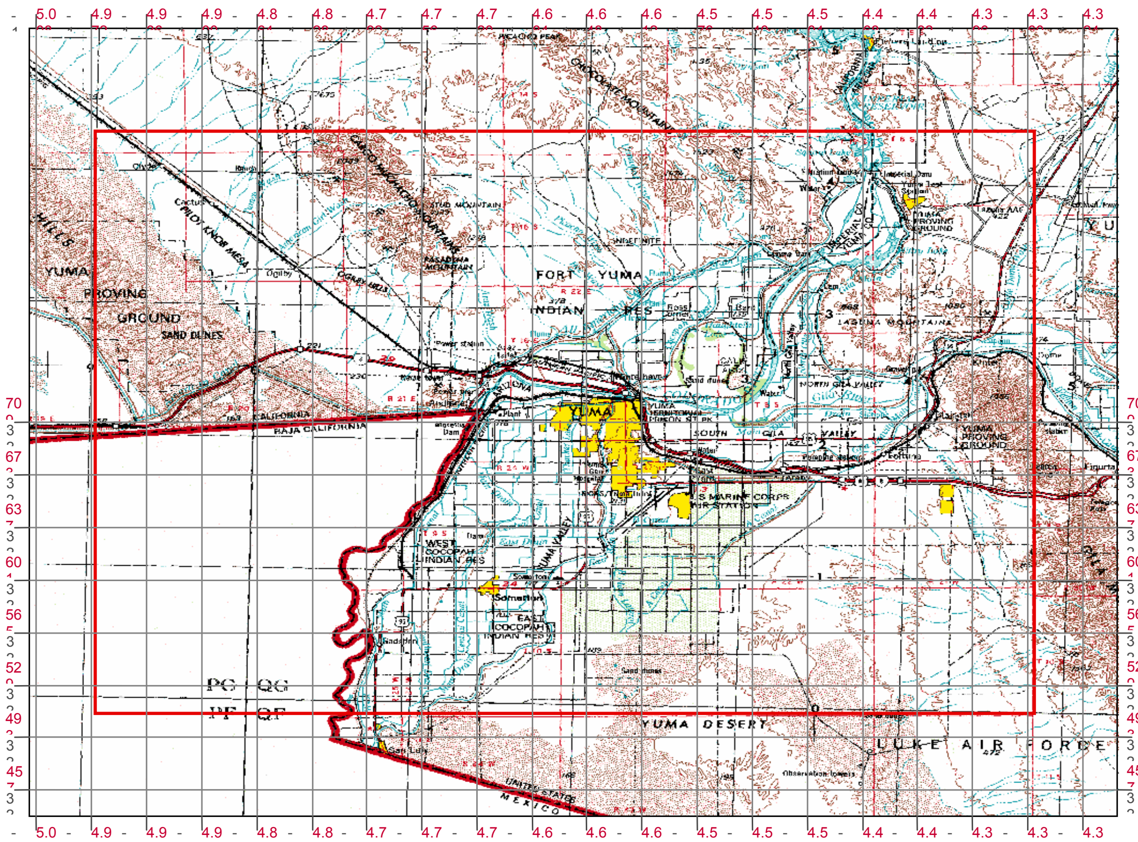


Figure 5-1. Yuma PM_{10} Emissions and Air Quality Modeling Domain (Orange Rectangle)

The windblown dust category was divided into six categories (see Table 5-4), with fallow agricultural fields, miscellaneous disturbed areas, and unpaved agricultural roads accounting for 94% of the windblown PM_{10} emissions. The wide differences between the surface area of each category and the annual emissions reflect the variable potential of the different land surfaces to produce windblown dust emissions. These figures, which come directly from the contractor's inventory (see Appendix A of the TSD), reflect the modeling area, which is 50% larger than the nonattainment area.

Table 5-4. Windblown PM_{10} Emissions		
Windblown Emissions	**Acres**	**Tons/Yr**
Fallow Agricultural Fields	18,100[16]	6,584
Miscellaneous Disturbed Areas	26,000	33,996
Unpaved Agricultural Roads	3,168	4,179
Urban Disturbed Areas	4,100[2]	5,442
Alluvial Plains and Channels	141,000	2,517
Native Desert	74,300	382

SOURCE: Yuma Maintenance Plan TSD, 2006

5.3.2 Additional Aspects of the Emissions Inventory

The PM_{10} emissions inventory for modeling, developed for the Yuma study area, covered eight days each for the years 1999 and 2016 (Table 5-5). The inventory was completed before the air quality design dates were chosen. Therefore, these emission inventory dates do not match the chosen air quality dates exactly. The emission inventory date was matched with the most appropriate air quality date, based on season, day-of-week, and presence or absence of agricultural emissions and windblown emissions.

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[16] The corrected number of fallow (vacant) agricultural acres in the Yuma Study area is 18,100, and in the Yuma Nonattainment Area, 14,000. The estimate of 181,000 acres for fallow agricultural land comes directly from the contractor's emission inventory report, reprinted in the Technical Support Document as Appendix A. On page 7 of the report, the authors state that because "vacant agricultural land varies by season, the total acreage of agricultural land was multiplied by the following percentages: fall = 35%, winter = 40 %, spring = 10%, and summer = 10%. The windblown emissions from this acreage went into the air quality model.

In later discussions with the Yuma farming community, it became obvious that this estimate was too large. Based on Yuma area farming practices, this estimate was reduced by 90%, which yielded a "vacant (or fallow) field acreage" of 14,000 acres in the nonattainment area on an annual basis. More discussion of this subject can be found in Appendix C in the Technical Support Document.

The over estimation of windblown emissions based on the 181,000 acres contributed to the model's over estimation of measured particulates concentrations on March 31, 1999. But because it was an over estimate, and because compliance with the standards was demonstrated, it is not necessary to redo the air quality modeling.

[2] The corrected unpaved road acreage of 4,100, in contrast to the original contractor's estimate of 16,798, is based on the Farm Service Agency's estimate that 2% of all ag lands are unpaved roads, not the 8.5% used by the contractor. See Appendix F in the TSD for more details.

Table 5-5. Study Dates for the Emissions Inventory	
Julian Day	**Calendar Date**
99015	Friday, January 15, 1999
99017	Sunday, January 17, 1999
99105	Thursday, April 15, 1999
99107	Saturday, April 17, 1999
99196	Thursday, July 15, 1999
99198	Saturday, July 17, 1999
99288	Friday, October 15, 1999
99290	Sunday, October 17, 1999
13015	Tuesday, January 15, 2016
13020	Sunday, January 20, 2016
13105	Monday, April 15, 2016
13110	Saturday, April 20, 2016
13196	Monday, July 15, 2016
13201	Saturday, July 20, 2016
13288	Tuesday, October 15, 2016
13293	Sunday, October 20, 2016

SOURCE: Yuma Maintenance Plan TSD, 2006

5.3.3 Gather Additional Information to Estimate Mexican Emissions

In addition to the modeling completed for this maintenance plan, data pertaining to Mexican emissions are being obtained through the Western Arizona-Sonora Border Air Quality Study (WASBAQS). With funding provided by U.S. EPA Region 9, ADEQ is conducting a Binational Air Quality Study for the Yuma-San Luis Border Region. This study is anticipated to determine the type and sources of harmful compounds in the air, and relate the emissions of these compounds to their concentrations in the air through computer modeling. Subject to the availability of federal funding, data collection for this study will occur over the next two years (2006 - 2007) and includes meteorological measurements and air quality measurements from various locations within the Study area. Once all the data were collected, provided federal funding is available, a complete emissions inventory will be built and meteorological and air quality modeling will be performed during 2007 and 2008 to evaluate the spatial and temporal distribution of the air pollution. Additionally, a health risk assessment during 2008 and 2009 will evaluate population exposure and the potential risk of such exposure, if federal funding continues. Final study results, expected in late 2009, will include an evaluation of the contribution of the various emissions sources and analyze various potential emissions reductions techniques.

5.4 Background Concentrations

5.4.1 Introduction

Background concentrations of an air pollutant are those concentrations that would be measured in the total absence of any anthropogenic emissions in a particular study area. Outside of any study area, both anthropogenic and natural emissions give rise to background concentrations. The Yuma PM_{10} background concentrations arise from both natural and anthropogenic sources in Mexico, California, and other parts of Arizona. These concentrations are transported into Yuma and are considered that part of the total aerosol that is not subject to reduction through local controls.

Concentrations of PM_{10} prevail outside the Yuma modeling domain. They result from both natural and anthropogenic emissions outside the modeling domain, but are transported into it. These "outside" or "background" PM_{10} concentrations contribute to the locally monitored concentrations. They have to be accounted for in assessing the air quality in Yuma.

To quantify the Yuma background concentrations, monitored PM_{10} concentrations from outside the Yuma modeling domain, mixing heights, wind speeds and directions, and the hourly distribution of background PM_{10} concentrations were all analyzed. The calculated background concentrations are added to those predicted by the model, which are based entirely on local Yuma emissions. The sum of concentrations coming from the emissions within the modeling domain plus background PM_{10} concentrations – otherwise known as the "total prediction" — can then be compared with the measurements.

5.4.2 Data Sources

Ambient PM_{10} monitoring data for the design days were available in 24-hour averages from several locations, all of which were brought into the background calculations. Hourly PM_{10} concentration profiles were obtained from Green Valley, Arizona and Calexico, California. Wind speed and direction were obtained from several sites in the Yuma vicinity. These locations are contained in Table 5-6. Mixing heights were calculated from the upper air observations in Tucson.

Table 5-6. Measurement Sites in the Background Calculations Particulate Matter (PM)			
$PM_{2.5}$ and $PM_{2.5-10}$ (24-Hour Averages)	**PM_{10} (24-Hour Averages)**	**PM_{10} Hourly**	**Wind Speed And Direction**
Yuma	Yuma		Yuma
		Green Valley	Many Others
Organ Pipe	Organ Pipe	Calexico, CA	
Ajo			
El Centro, CA			
Brawley, CA			

SOURCE: Yuma Maintenance Plan TSD, 2006

5.4.3 Overview of PM_{10} Background Calculations

The calculation of background concentrations for Yuma is a multi-step process that accounts for wind direction, wind speed, mixing heights, and gravitational settling of fine and coarse PM.

The contribution to background PM_{10} in Yuma uses wind direction, wind speed, and mixing heights in the composite estimation process. The wind direction is used to identify which source sector contributes for that hour. For example, if the wind direction is out of the south to the west, then the hourly pattern was based on the PM measurements from Calexico. All other sectors were based on Green Valley. Thus, the regional composite PM background concentration – on an hourly basis -- is the 24-hour concentration recorded at a background site multiplied by the hourly percent value from either the Calexico or Green Valley sectors. These hourly concentrations, as explained below, were treated further to account for particle settling. Table 5-7 gives both the outlying PM_{10} concentrations and the Yuma background concentrations derived from them.

Table 5-7. Calculated Background PM_{10} Concentrations								
Date	Upwind PM_{10}	Winds		Calculated Background PM (ug/m^3)			Yuma PM_{10}	Back-ground %*
		Speed	Dir.	$PM_{2.5}$	$PM_{2.5-10}$	PM_{10}		
12 Jan	40-60	Low	SSE-WSW	7.1	8.2	15.3	52	30
31 Mar	40-60	High	WNW	10.1	14.4	24.5	88	28
30 May	20-120	Low	SW,NW	10.5	20.7	31.3	26	123
23 Jun	30-50	High	SSW-SSE	10.2	21.4	31.6	44	73
17Jul	25-40	Low	WNW-NNW	10.5	17.9	28.4	19	150
8 Nov	25	Low	WNW	5.9	7.6	13.6	32	43
8 Dec	30-40	Low	NNW	6.8	7.2	14.0	46	30

*%: the background concentration as a percentage of Yuma PM_{10}. The average of the two concentrations was used where available.

SOURCE: Yuma Maintenance Plan TSD, 2006

5.4.4 Results of Background Calculations

These calculations yielded reasonable background values for five of the seven design days (Table 5-7). For May 30 and July 17, however, the calculated background concentrations exceeded the Yuma measurements. While this is not impossible, it does defy the logic of the entire background exercise. The Yuma concentrations on these two days were extremely low: 21 and 30 ug/m^3 on May 30 and 19 ug/m^3 on July 17 (see Table 5-9). Concentrations in the surrounding areas were apparently higher than in Yuma, as calculated by this method. In place of these calculated values, the 24-hour average PM_{10} concentrations from Organ Pipe National Monument for these two dates have been substituted.

Part of the anomalously high background concentrations on the two dates could be that the same sources are contributing to both “background” concentrations and concentrations in Yuma. The distances involved argue against large contributions to Yuma PM_{10} from these outlying sources. The background sites of Palo Verde (107 miles), Ajo (102 miles), and El Centro (65 miles) are too distant from Yuma to make major contributions to its PM_{10} loading. In addition, the Ajo and Palo Verde sites lie east of Yuma, which puts them predominantly downwind due to prevailing daytime westerly and southwesterly winds. As Table 5-8 shows, however, the contributions are on the order of 30% with, on occasion, even higher contributions possible. Sources in the immediate vicinity of these background monitors, as well as sources between them and Yuma, do contribute to both concentrations.

In place of these calculated values, the 24-hour average PM_{10} concentrations from Organ Pipe National Monument for these two dates have been substituted. These final background values and the percentage they comprise of the Yuma concentrations are shown in Table 5-8.

Table 5-8. Final Adjusted Background PM_{10} Concentrations

Date	Winds	Yuma PM_{10} (ug/m^3)		Background PM_{10} (ug/m^3)			
		Original	Duplicate	$PM_{2.5}$	$PM_{2.5-10}$	PM_{10}	%*
1/12/99	Low	55	48	7.1	8.2	15.3	29.7
3/31/99	High	102	74	10.1	14.4	24.5	27.8
5/30/99	Low	21	30	**5.9**	**8.1**	**14.0**	53.8
6/23/99	High	43	44	10.2	21.4	31.6	72.6
7/17/99	Low	19		**5.7**	**8.5**	**14.2**	73.7
11/8/99	Low		32	5.9	7.6	13.6	42.5
12/8/99	Low		46	6.8	7.2	14.0	30.4

SOURCE: Yuma Maintenance Plan TSD, 2006

(Background values for May 30 and July 17 have been set equal to the concentrations measured at Organ Pipe National Monument on these dates.)
*%: Background concentration as a percentage of Yuma PM_{10}. The average of the two concentrations was used where available.
** 24-Hour average Organ Pipe National Monument $PM_{2.5}$, $PM_{2.5-10}$, and PM_{10} concentrations substituted for calculated values, which exceeded the measured PM_{10} concentrations in Yuma

5.5 Model Simulations for the Base Year

PM_{10} concentrations in Yuma, Arizona were simulated using the Industrial Source Complex Short Term (Version-3) – ISCST-3. This numerical model is a steady-state Gaussian dispersion model that has been approved by the U.S. Environmental Protection Agency and has a long history of applicants in both the industrial and urban settings. The modeling domain consisted of an array of 4000 x 4000 meter grids, with a total of 154 grids covering the City of Yuma and the vicinity. Table 5-9 illustrates the results of modeling the hourly emissions files with the day-specific meteorological files to generate day specific 24-hour average predictions for PM_{10}. These model-predicted concentrations have been added to the background values, and plotted against the measurements at the Juvenile Center in Figure 5-2.

Table 5-9. Illustrates the 1999 PM_{10} Results at the Yuma Juvenile Center

Actual 1999 Met & Air Quality Day	1/12/99	3/31/99	5/30/99	6/23/99	7/17/99	11/8/99	12/8/99
Pechan Inventory Day	1/15/99	4/15/99	4/17/99	7/15/99	7/17/99	10/15/99	1/15/99
PM_{10} (ug/m^3)	**148**	**138**	**48**	**67**	**46**	**60**	**85**

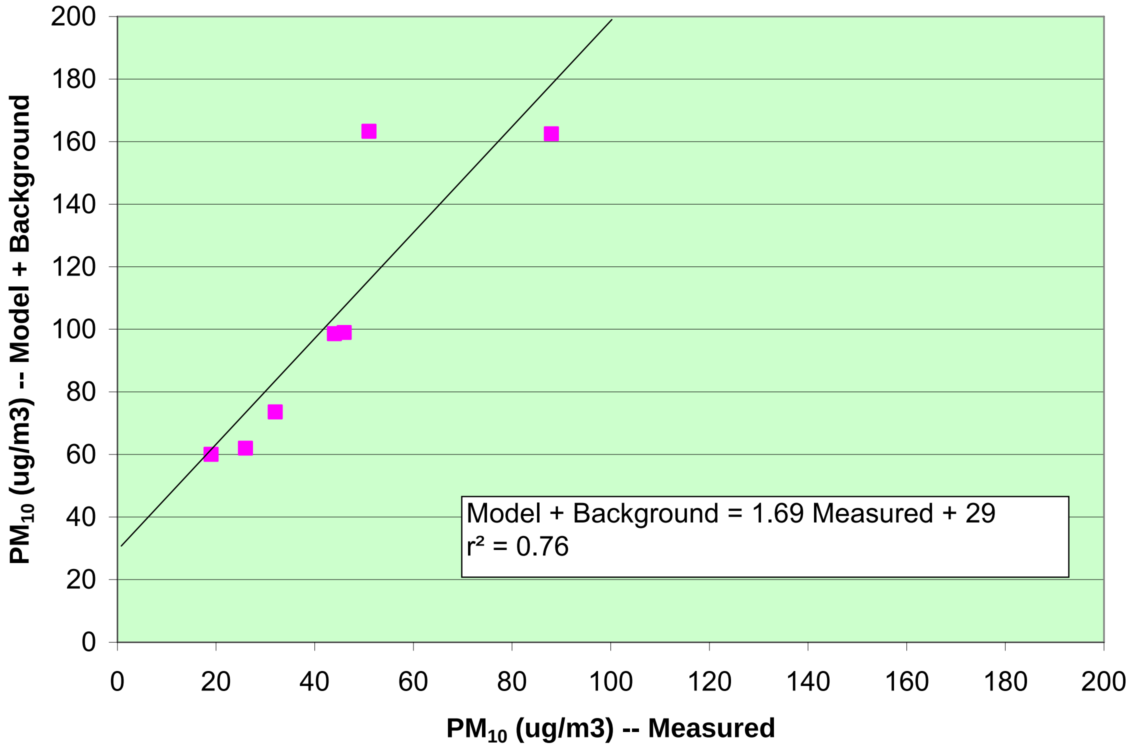

Figure 5-2. Total Prediction (Model + Background) versus Observations of PM_{10} in 1999 – in an X-Y Scatter Plot, with March 31 Shown with the Original and Scaled Emissions

The output files generated were also used to create day-specific PM_{10} concentration maps for the Yuma domain. One such concentration map is Figure 5.3 for the high wind concentration field

5.5.1 Modeling of the High-Wind Day

The high-wind day of March 31, 1999, was modeled. As shown in Table 5-9, the predicted concentration of 138 ug/m3, when added to the background value of 25 ug/m3, over predicts the paired measurements of 74 and 102 ug/m3, but the over prediction is not serious. The real problem arose in how the model predicted throughout the domain (Figure 5-3). Maximum predicted concentrations anywhere in the domain ranged from 300 to nearly 800 ug/m^3, well above the highest concentrations in the monitoring record. Numerous sensitivity tests were performed to improve the model performance, but these were not successful. These tests are described in Appendix B of the Yuma Maintenance Plan TSD. Eventually, after discussions with EPA, it was decided to drop this date from the analysis. A full discussion of this issue is given in Section 2-5 of the Technical Support Document.

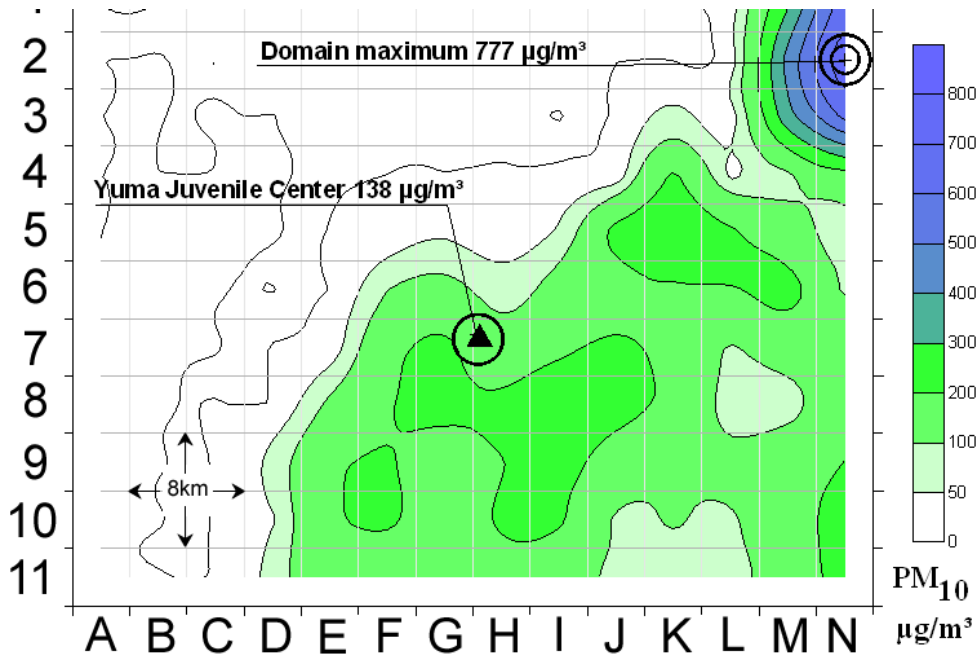

Figure 5-3 March 31, 1999, PM_{10} Results for the Yuma Domain (High Wind)

5.5.2 Model Predictions Throughout the Domain

While model performance is focused on the location of the monitoring site at the Yuma Juvenile Center, the larger picture of how PM_{10} concentrations are distributed across the modeling domain of Yuma is also important. The Clean Air Act requires that all points within an airshed meet the air quality standards. This section demonstrates that the PM_{10} standards are met throughout the Yuma area on low-wind days.

Figure 5-4 illustrates that on the low-wind day, the predicted concentrations in the 25 to 50 ug/m^3 range in cell 9F can be attributed to construction emissions: road and general building construction in Somerton. These emissions are evidently high enough to produce these localized concentrations above the 0 to 25 ug/m^3 range.

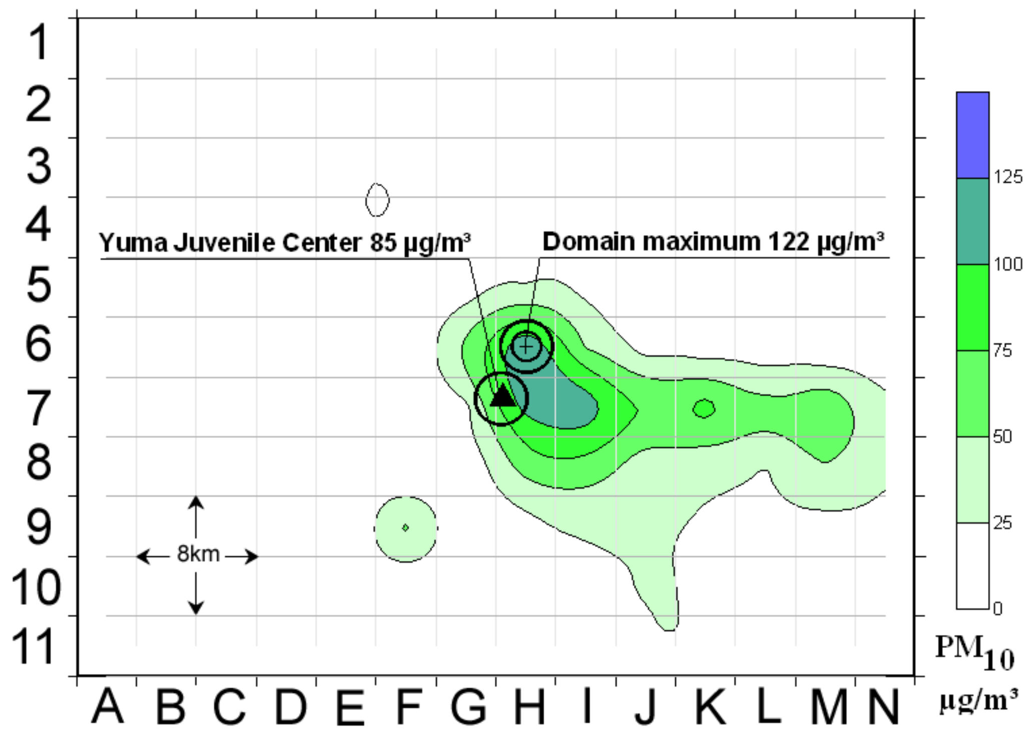

Figure 5-4. December 8, 1999, PM_{10} Results for the Yuma Domain (Low Wind)

The simulated concentrations throughout the modeling domain shed some light on how elevated PM_{10} concentrations are distributed throughout the Yuma area on a low-wind day (Figures 5-4) For the low-wind day of December 8, 1999, the measured concentration was 46 ug/m^3; the model-predicted concentration at the monitor was 85 ug/m^3; and the maximum prediction anywhere in the domain was 122 ug/m^3. On that day the highest predicted concentrations and the domain maximum were concentrated in three grid cells (total area of 48 square kilometers) immediately to the northeast and east of the monitor. This close proximity of the monitor with the predicted maximum suggests that under low-wind conditions the model adequately places the highest concentrations in the region near the monitor.

The maximum predicted PM_{10} concentrations anywhere in the domain are now examined in light of the over-predictions at the monitoring site. Table 5-10 begins with the observation ("Obs") of the 24-hour average PM_{10} concentration at the Juvenile Center. On its right is the calculated background value ("Back"). Because background PM_{10} comes from outside of the Yuma area, it is subtracted from the observation ("Obs – Back"). This difference – the observation with the background subtracted – can then be compared with the ISC model prediction. Dividing this difference by the prediction gives the decimal fractions in the "Ratio" column. For those total predicted concentrations (model plus background) within the standard of 150 ug/m^3, these fractions are not used. Instead, the model prediction plus the background goes into the far right column called "normalized maximum."

For those predictions that would be above the standard, the fractions are multiplied by the value of the predicted maximum anywhere in the domain (next to last column), with the background added back in to give the "Normalized Maximum". These concentrations are the highest anywhere in the modeling domain. They account for both the background concentration and for the degree of over-prediction by the modeling system. More importantly, these normalized maximum, domain-wide PM_{10} concentrations, reflect the distribution and magnitude of PM_{10} emissions throughout the Yuma area. This set of predicted concentrations demonstrates that all of the Yuma airshed complies with the 24-hour PM_{10} standard, not just the Juvenile Center.

Table 5-10. Domain-Wide PM_{10} Concentrations in Yuma, Based on ISC Model Predictions at the Juvenile Center and Throughout the Domain

Date	Yuma Juvenile Center					Anywhere in the Modeling Domain	
	Obs	Back	Obs - Back	ISC Model Prediction	Ratio(Obs – Back) to Prediction	ISC Predicted Maximum	Normalized Maximum (with Back-Ground)
1/12/99	51	15	36	148	0.24	195	62
5/30/99	26	14	12	48	0.25	78	92
6/23/99	44	32	12	67	0.18	97	129
7/17/99	19	14	5	46	0.11	69	83
11/8/99	32	14	18	60	0.30	100	114
12/8/99	46	14	32	85	0.38	122	136

SOURCE: Yuma Maintenance Plan TSD, 2006

Notes:

(All values are calculated or measured PM_{10} concentrations in µg/m3 averaged for 24 hours.)

Obs Observation or measurement of PM_{10}

Back Background PM_{10} concentration (calculated)

Obs – Back Difference of the two

Ratio (Observation minus Background) divided by the model prediction

Normalized Maximum Highest predicted PM_{10} in the domain, normalized for the model over-prediction, and with background added in.

Compliance is shown for the six low-wind days, in which the normalized domain maxima vary from 62 to 136 ug/m^3, within the 150 ug/m^3 standard.

5.6 Model Simulations for the Projected Year 2016

For the 2016 air quality predictions, Pechan built a set of 2016 emissions files. These files were adjusted and modeled in the same fashion as the 1999 files and generated the PM_{10} predictions of Table 5-11. Figure 5-5 illustrates the low-high wind simulation of December 8, 2016.

Table 5-11. Illustrates the 2016 PM_{10} Results at the Yuma Juvenile Center							
Actual Met & Air Quality Day	1/12/99	3/31/99	5/30/99	6/23/99	7/17/99	11/8/99	12/8/99
Pechan Inventory Day	1/15/99	4/15/99	4/17/99	7/15/99	7/17/99	10/15/99	1/15/99
PM_{10} (ug/m^3)	107	28	48	49	28	37	61

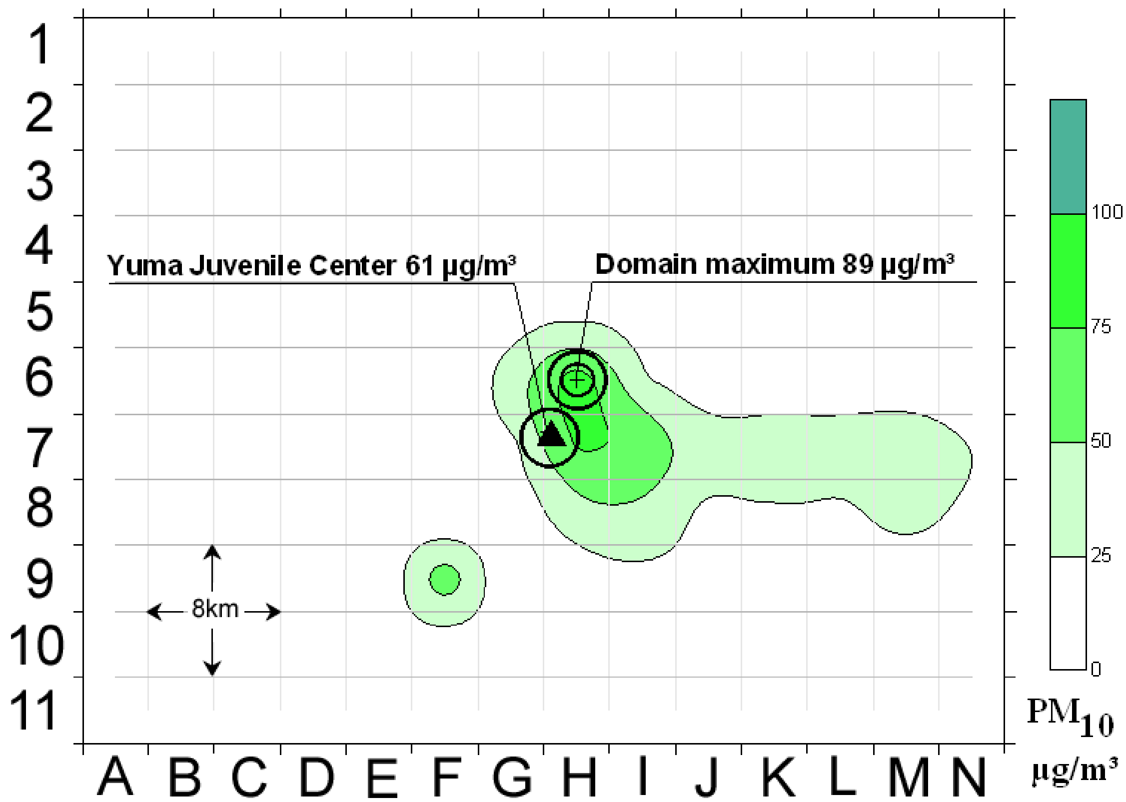

Figure 5-5. December 8, 2016, PM_{10} Predictions for the Yuma Domain

5.7 Demonstration of Attainment

5.7.1 24-Hour PM_{10} NAAQS

Attainment in 2016 is shown by examining the 1999 observations, calculating the ratio of the 2016 to 1999 total predictions, and applying these ratios to the base year observations. All of these figures, except the ratios, have been assembled in Table 5-12.

Table 5-12. PM_{10} 24-Hour Concentrations in 1999 and 2016 in Yuma: Observations and Model Results						
Date	**1999: Observations & Model Results**				**2016: Model Results**	
	Average Observation	**Model Prediction**	**Background**	**Total Prediction**	**Model Prediction**	**Total Prediction**
1/12/99	51	148	15	163	107	122
5/30/99	26	48	14	62	48	62
6/23/99	44	67	32	101	49	81
7/17/99	19	46	14	60	28	42
11/8/99	32	60	14	74	37	51
12/8/99	46	85	14	99	61	75

SOURCE: Yuma Maintenance Plan TSD, 2006

* With emissions of high-wind hours rolled back

In Table 5-13, the 2016 predicted concentrations are shown in the far right column. The concentrations in Table 5-13 demonstrate that Yuma air quality over a ten-year horizon will remain well in compliance with the 24-hour PM_{10} standards.

Table 5-13. Yuma PM_{10} 24-Hour Concentrations for 2016							
Date	**1999**			**Model Predictions**		**Ratio (2016/1999) Model Predictions**	**2016 Calculated PM_{10}**
	Obs	**Back**	**Obs –Back**	**2016**	**1999**		
1/12/99	51	15	36	107	148	0.72	41
5/30/99	26	14	12	48	48	1.00	26
6/23/99	44	32	12	49	67	0.73	41
7/17/99	19	14	5	28	46	0.61	17
11/8/99	32	14	18	37	60	0.62	25
12/8/99	46	14	32	61	85	0.72	37
Avg	43.7	18.3				0.76	

Notes: (Units are $\mu g/m^3$)
Obs is the observation: 24-hour average PM_{10} at the Yuma Juvenile Center
Back is the background concentration
Obs – Back is the background subtracted from the observation

SOURCE: Yuma Maintenance Plan TSD, 2006

5.7.2 Annual PM_{10} NAAQS

Similar results were found for the annual standard. The base-year annual PM_{10} average was 37.0 ug/m^3. This average is based on 56 sampling days, 29 of which had both the original and duplicate samples taken. Based on the background and model predictions for the seven design dates of 1999, this annual average is expected to decrease slightly by 2016 – to 32 ug/m^3. The necessary calculations for this exercise are illustrated in Table 5-14.

Table 5-14. Demonstration of Attainment for the Annual PM_{10} Standard in 2016 in Yuma		
Line #	**Description**	**Concentration**
1	Average PM_{10} : 6 Design Days 1999 ($\mu g/m^3$)	36.3
2	Average PM_{10} : 6 Background Concentrations ($\mu g/m^3$)	17.1
3	Average: 6 Background as a Fraction of Observations	0.47
4	Average: 6 2016/1999 Model Prediction Ratio	0.73
5	1999 Annual Average PM_{10} (Juvenile Center) ($\mu g/m^3$)	37.0
6	1999 Average Background Value ($\mu g/m^3$) [line 3 x line 5]	15.5
7	1999: Annual Average – Average Background ($\mu g/m^3$) [line 5-6]	21.5
8	2016 local PM_{10} ($\mu g/m^3$) [line 7 x line 4]	15.8
9	2016 Annual Average ($\mu g/m^3$) [line 8 + line 6]	31.3

SOURCE: Yuma Maintenance Plan TSD, 2006

An examination of annual PM_{10} averages before and after 1999 reveals that this method would predict attainment in 2016 for the range of concentrations in the most recent ten years. The base year of the study – 1999 – is in no way unique or unusual (Table 5-15 and Figure 5-6).

Table 5-15. Yuma PM_{10} Annual Averages: 1985 – 2004	
Year	**Annual Average**
1985	**63**
1986	**56**
1987	50
1988	41
1988	38
1989	**52**
1989	37
1990	**57**
1991	41
1992	29
1993	31
1994	32
1995	35
1996	36
1997	36
1998	47
1999	35
2000	42
2001	41
2002	48
2003	38
2004	40

SOURCE: Yuma Maintenance Plan TSD, 2006

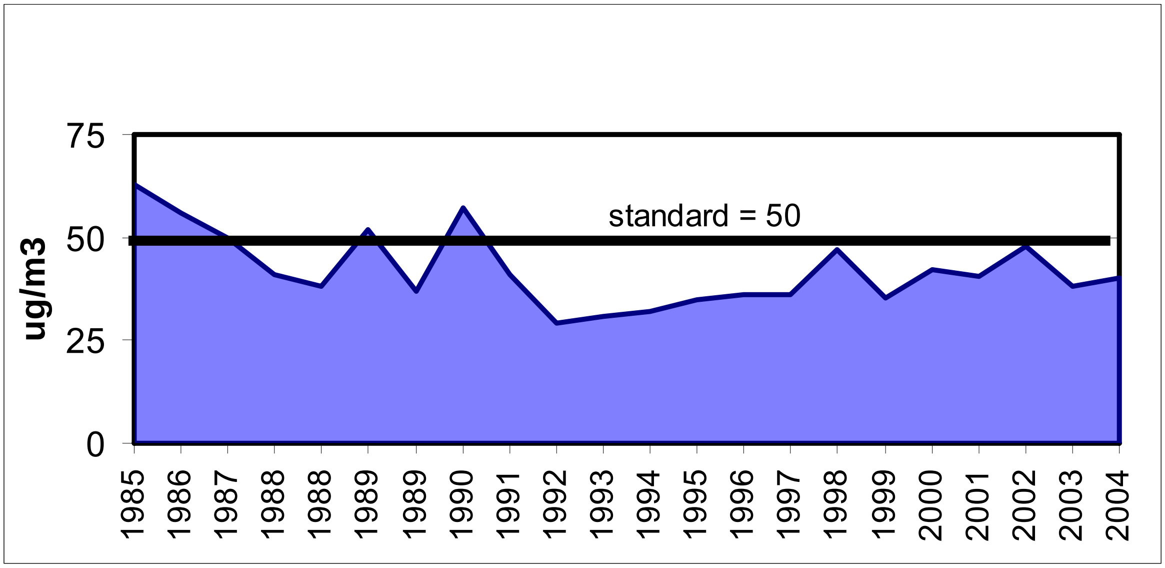

Figure 5-6. Annual PM_{10} Averages for Yuma: 1985 – 2004

In conclusion, attainment is modeled for both the 24-hour PM_{10} NAAQS and the annual PM_{10} NAAQS through 2016 for the Yuma air quality planning area. This maintenance predicts attainment for the next 10 years. If an exceptional event causes the Yuma area to exceed the 24-hr average NAAQS, ADEQ will flag the event as a natural event. If the violation occurred outside of the Yuma Nonattainment Area, it would not be flagged.

6.0 CONTROL MEASURES

In order to redesignate Yuma to attainment, Clean Air Act Section 107(d)(3)(E)(iii) requires that the Administrator must determine that the improvement in air quality is due to permanent and enforceable reductions in emissions resulting from implementation of control measures. The Administrator must also fully approve a Maintenance Plan that meets the requirements of Section 175A. Section 175A requires that the Maintenance Plan contain such additional control measures as may be necessary to ensure maintenance for at least 10 years after redesignation.

6.1 Attainment Demonstration Control Measures

Prior to the Clean Air Act Amendments of 1990, Yuma was categorized as a Group I PM_{10} nonattainment area with a 95 percent or higher probability of exceeding the standards for particulate matter. The two largest source categories at that time were agricultural burning and unpaved roads. The 1990 Amendments designated all Group I areas by operation of law as moderate PM_{10} nonattainment areas. The Act required moderate PM_{10} nonattainment area plans for such areas to include provisions to ensure implementation of reasonably available control measures (RACMs) by December 10, 1993, to achieve attainment by December 31, 1994. RACM and RACT were not required, however, for sources that did not contribute significantly to violations of the 24-hour or annual PM_{10} NAAQS, or if additional controls on the sources would not have expedited attainment of the NAAQS. Section 189(e) of the Act required implementation of RACM for major stationary sources of gaseous precursors of PM_{10}, except where EPA determined that such sources did not contribute significantly to PM_{10} levels above the standard.

6.2 Adopted Attainment Control Measures

ADEQ originally began working with the Yuma area stakeholders in 1991 to identify the significant sources of PM_{10} emissions in the Yuma area. The stakeholders included Federal, state, and local agencies; the Irrigation Districts and the Yuma County Water Users' Association; and the Indian tribes in the area. ADEQ and the stakeholders identified the measures that were needed to control these emissions that could be implemented in the Yuma area by December 10, 1993. The initial SIP designed to bring Yuma into attainment was submitted to EPA November 15, 1991.

Chapters 5 and 6 of the 1991 SIP explained the determination that in order to reduce Yuma's PM_{10} design value of 52 $\mu g/m^3$ to 50 $\mu g/m^3$ or less, an emission reduction of six per cent from the 1990 emission inventory, equivalent to 405.6 tons per year (TPY), would be required by 1994. Chapter 3 of the 1991 SIP explained that a 1.1% emission reduction from the 1990 baseline, 67.5 TPY, would be achieved through two measures: (1) conversion of agricultural land to residential use at the rate of approximately 1% per year from 1987-2000, and (2) projected County paving projects. Yuma County's projected paving rate was 5 miles per year of unpaved roads or unpaved parking lots and stabilization of an additional five miles of unpaved roadways per year. Additional control measures were required for the remaining 5% reduction from the 1990 PM_{10} baseline. Reduction of traffic on unpaved Irrigation District roads achieved in 1991 through improved weed control operations had already reduced Vehicle Miles Traveled (VMT) by an estimated 25,478 or 32% of the 80,000 VMT reduction needed, resulting in 17.47 TPY in emission reductions in 1991, as discussed on Page 47. Table 6.0 on page 48 of the 1991 SIP listed 16 RACMs considered to achieve attainment by 1994, noted that not all had been adopted, and identified the selected attainment demonstration measures. Control of dust from storage piles was RACM already included in the base case, and Table 6.0 did not list the estimated emission reductions from this measure. The other adopted RACMs were estimated to result by the end of 1994 in 403.6 TPY reductions with an additional non-creditable reduction of 3.8 TPY from a reduced tillage demonstration project, slightly more than the total tonnage reduction needed. Table 6.1 on page 49 of the 1991 SIP listed measures selected and modeled to maintain the PM_{10} standard through the year 2000, with slightly increased reductions from the covered haul truck and rerouted traffic RACMs and significantly greater reductions from the reduced traffic on unpaved roads RACM.

In a letter dated May 14, 1992, EPA stated that deficiencies in the 1991 SIP prevented approval but did not list the deficiencies. A copy of this letter appears in **Appendix J**. ADEQ and Yuma stakeholders developed a revised SIP that was submitted to EPA in July, 1994. EPA's Completeness Determination letter for this SIP is also in **Appendix J**. The 1991 SIP listed in Table 4.1 on pages 28-29 one RACM that had been modeled in the base case (#14 Control dust from storage piles), eight newly adopted RACMs, a reduced tillage demonstration project that was not creditable, and four RACMs that were not adopted. The Executive Summary and Table 4.0 of the 1994 SIP stated that the revised emissions reductions were estimated at 599.8 TPY in 1994, which was 52.6% or 206.8 TPY beyond what was required to demonstrate attainment. Table 4.2 showed projected emissions for 2000. By 2000, emissions reductions were projected to be 459.7 TPY, which was 69.2% or 188 tons beyond what was required to demonstrate maintenance through the year 2000. Table 6.1 of the 2006 Maintenance Plan lists the RACMs in the 1994 SIP selected to achieve attainment by 1994. Table 6.1 estimated that these control measures would result in a PM_{10} emissions reduction amounting to 599.8 tons in 1994

Table 6-1. Reasonably Available Control Measures (RACMs) Adopted in the Yuma Moderate PM_{10} Nonattainment 1991 and 1994 SIPs

Reasonable Available Control Measure	Total Units In Inventory	Total Units Treated	Treatment Efficiency	Estimated Uncontrolled Emissions Tons/ Year	Estimated Reduction Tons/Year
Control of dust from storage piles (modeled as RACM in the Base Case)	See Tables 6.0 and 6.1 in 1991 SIP; Tables 2 and 3 in 1994 SIP	See Tables 6.0 and 6.1 in 1991 SIP; Tables 2 and 3 in 1994 SIP	See Tables 6.0 and 6.1 in 1991 SIP; Tables 2 and 3 in 1994 SIP	See Tables 6.0 and 6.1 in 1991 SIP; Tables 2 and 3 in 1994 SIP	See Tables 6.0 and 6.1 in 1991 SIP; Tables 2 and 3 in 1994 SIP
Yuma County Open Burning Permit Program	27, 923 acres	17,958 acres		455.6	293.0
Pave Unpaved Roads	254 miles	10 miles	0.9	2,063.1	73.1
Stabilize Unpaved Roads		18.3 miles	0.6		88.9
Reduce Traffic on Unpaved Roads	400 miles Irrigation Districts; 250 miles public roads	200 miles	0.4	292.1	54.6
Pave Parking Areas	33 parking lots	20 parking lots	0.9	60.4	31.1
Stabilize Parking Areas		13 parking lots	0.5		11.9
Travel Reduction Strategies	337,000 vehicle miles traveled (VMT)	50,000 VMT reduction	1.0	105.0	14.9
Cover Haul Trucks	Data not available	80% compliance rate	0.8	16.8	13.4
Temporary Sources of Dust on Paved Roads	Data not available	Data not available	0.8	16.8	13.4
Dust Control Plans for Construction Land Clearing	500 acres	48 acres	0.9	60.0	5.4
Control Dust on Open Land	10,000 acres	10 acres	0.9	116.8	0.1
Total Estimated Emissions Reduction (beyond Base Case)					**599.8**

SOURCE: *Final State Implementation Plan Revision for the Yuma PM_{10} Nonattainment Area, July 1994, pp. 28-29 and cited Tables from 1991 and 1994 SIPs.*

A comparison of the control measures contained in the 1991 SIP and the 1994 update to the SIP displayed in Table 4.0 of the 1994 SIP appears below, with additional information, in Table 6.2.

Table 6-2. Comparison of Commitments to Reasonably Available Control Measures Adopted in 1991 and 1994 by the Implementing Agencies in the Yuma Moderate PM_{10} Nonattainment Area

RACM DESCRIPTION	1991 COMMITMENTS	1994 COMMITMENTS	CHANGE
Control of dust from storage piles	Modeled in the Base Case	No change	None
Pave or chemically stabilize unpaved roads	Pave: 5 miles/year8hg	Pave: 43.05 miles	Pave: +39.05 miles
	Chemically stabilize: 5 miles/year	Chemically stabilize: 18.3 miles. U.S. Army Yuma Proving Grounds and Immigration and Naturalization Service also stabilized roads	Chemically stabilize: +15.36
Provide for traffic rerouting or rapid clean up of temporary (and not readily preventable) sources of dust on erosion runoff, mud/dirt carryout areas, material spills, skid control sand). Delineate who is responsible for cleanup	Somerton: ¼ mile farmland trackout elimination by 12/31/93	Somerton: 6 hours	Somerton: +6 hours
	City of Yuma: No credit claimed	Yuma: 45 minutes	Yuma: +45 minutes
	Yuma County: No credit claimed	Yuma County: 6 hours	Yuma County: +6 hours
Require dust control plans for construction or land clearing projects	Not adopted	Annual average number of projects: 48	+48 projects
Pave or stabilize unpaved parking areas	Pave: Not adopted	Pave: 20 parking lots 366.5 acres	Pave: +20 parking lots +366.5 acres
	Chemically stabilize: Not adopted	Chemically stabilize: 13 parking lots 15.4 acres	Chemically stabilize +13 parking lots; +15.4 acres

RACM DESCRIPTION	1991 COMMITMENTS	1994 COMMITMENTS	CHANGE
Reduce traffic on unpaved roads through use of speed bumps, low speed limits, barricades, ticketing trespassers to encourage use of paved roads, and use of fish for weed control instead of heavy equipment	Irrigation District roads: Reduced authorized use of 38,370 VMT by 25,478 VMT (17.47 TPY) in 1991; Commit to further reduce 54,522 VMT unauthorized use; 54.6 TPY	No change to total reduction goal of 80,000 VMT by 1994 on Irrigation District roads; City of Yuma added barricades;	No change
Require haul trucks to be covered	Number of haul trucks compliance target: 80%; 13.4 TPY by 1994	Resolutions adopted 11/5/91 by Somerton to enforce Arizona Administrative Code R18-2-406 starting 1992 (later renumbered R18-2-606); by City of Yuma 11/4/91 and 6/15/94; and Yuma County11/6/91 to promote compliance with A.R.S. § 28-1873 .* City of Yuma Ordinance No. 2638 requires haul trucks to be covered. Number of haul trucks estimated at 52,665	No change
Control dust on open land and require curbing and pave or stabilize (chemically or with vegetation) shoulders or paved roads	No commitment	10 acres MCAS MOU	+10 acres + 0.1 TPY
Enforce policies and procedures that will have the effect of reducing vehicle miles traveled (VMT) in the nonattainment area	Annual VMT reduction: No commitment	Marine Corps Air Station bicycle path to City of Yuma and required carpooling Annual VMT reduction: 50,000	Annual VMT reduction: +50, 000 +14.9 TPY
*Copies of City of Somerton Resolution No. 405 (1991); City of Yuma Resolution Nos. 2682 (1991) and 2800(1994); and Yuma County Resolution Nos. 91-38 and 91-52; and A.R.S. § 28-1098 (formerly numbered §28-1873) appear in **Appendix H** for information purposes.			

6.3 Implemented Attainment Control Measures

Details of these measures implemented 1994-2001 are explained in the combined Local Government Agencies Annual RACM Reporting Form in **Appendix G**. A detailed list of the area source reasonable available control measures (RACMs) implemented in the Yuma area and the PM_{10} emission reductions attributed to each RACM for 2000 through 2004 is provided in Table 6-3**.** General descriptions of implemented measures and total emission reductions achieved from each category of control measure appear in narrative form below. One of the outcomes of the stakeholder process during the 1991–1994 timeframe was the formation of an air quality advisory group made up of ADEQ and Yuma area stakeholders. The purposes of the group were to track the effectiveness of the 1991 PM_{10} plan and the 1994 plan update, to analyze the results of implementing the control measures in the plan, and to recommend additional control measures as necessary and appropriate.

6.3.1 Control of Dust From Storage Piles

Both the 1991 and 1994 SIPs list this strategy as one that was modeled as Reasonable Available Control Measure (RACM) in the Base Case, but the SIPs do not contain any details about this measure. ADEQ has been unable to quantify emission reductions from this RACM included in the Base Case.

6.3.2 Yuma County Open Burning Permit Program

In 1998, ADEQ proposed adding Appendix C to its 1996-2000 Delegation Agreement with Yuma County to delegate the authority to perform open burning management activities throughout Yuma County. Apparently Appendix C was not finalized. Effective March 12, 2002, ADEQ entered into a Memorandum of Understanding (MOU) with the Yuma County Department of Health Services pursuant to A.R.S. § 49-501.E. and § 38-101, copies of which are in **Appendix H** for information purposes. The MOU will be renewed every five years. Under this MOU, the Yuma County Rural Metro Fire Department (Rural Metro) administers this open burning permit program following the Arizona Guidelines for Open Burning and using ADEQ permit application forms and procedural guidelines. Any individual who wishes to conduct an open burn in Yuma County must first obtain a permit from Rural Metro. Issued permits contain conditions allowing burning only when atmospheric conditions allow the dispersion of smoke and PM_{10} resulting from the open burn. This program is in effect countywide and also reduces emissions that would otherwise contribute to poor air quality within the air quality planning area. A copy of this MOU and the Guidelines, still in effect, appear in **Appendix H** for information purposes.

Table 6.3 discloses that significant PM_{10} reductions in the Yuma area has been achieved through the open burning permit program selected in the 1994 SIP on page 32. Wheat was being grown and burned on 27,923 acres in the Yuma Nonattainment Area in 1986, the latest year for which data were available for modeling from the Bureau of Land Management and U.S. Department of Agriculture. Of this amount, Yuma stakeholders agreed that the open burning permit program for Yuma would limit the maximum acreage of wheat that could be burned in any one year to 9773 acres. Consequently, emissions from open burning were decreased by **293.0 TPY** by 1994 and emissions have dropped even further in subsequent years, as explained below.

Rural Metro began keeping records in 1998 on permits issued and acreage burned, and it is still administering this open burning program in 2006. The agricultural stakeholders in the Yuma area have informed ADEQ that as a result of the residential and commercial development that has occurred in the Yuma Valley since 1994, fewer and agricultural fields remain to be burned.

ADEQ issued open burn acreage permits for fewer than 6500 acres per year during the period 1994-1996. Rural Metro furnished ADEQ with a report that Rural Metro issued permits for fewer than 9,000 acres each year for the period 1998-2004. Three Rural Metro employees operate the program. In 2005, Rural Metro issued permits to burn a total of 3,080 acres. The total acreage permitted for open burns in 2005 is substantially lower than the cap of 9,773 acres. The ADEQ and Rural Metro open burn acreage reports appear in **Appendix H**.

The City of Yuma informed ADEQ that it issued burn permits for only 20.5 acres of brush and weeds to be burned in 1998 within its jurisdiction. It issued burn permits for 220 acres of plants, plant material, tree trimmings, and weeds to be burned in 1999. As the information from Rural Metro and the City of Yuma attests, particulate matter from open burning has diminished substantially since 1991.

The Yuma County Open Burning Permit Program has been fully implemented. Less than 3500 acres have been burned the last two years, 6473 fewer acres burned than the 9773 acre cap agreed to in the 1994 SIP. Emission reductions from this program 2000-2005 have averaged **309 TPY**.

6.3.3 Unpaved Roads

The second largest source category of PM_{10} reduction has been achieved from control measures applied to unpaved roads. These roads are under the jurisdictions of the City of Yuma, City of Somerton, Yuma County; the local Irrigation Districts; the Yuma County Water Users' Association (YCWUA); and the Marine Corps Air Station (MCAS) in Yuma. According to the 1991 SIP, Irrigation Districts have jurisdiction over 400 miles of unpaved roads and 250 miles of unpaved roads existed in Yuma County in addition to the canal roads. Yuma County requires developers to pave all new private roads upon rezoning.

Two principal canals in the nonattainment area are used for water delivery, the East Main Canal and the West Main Canal. There are service roads on either side of these canals. Traffic can travel in either direction on these roads. These canals are owned by the Bureau of Reclamation, but are they are maintained by the YCWUA. The YCWUA issued an Encroachment License to the City of Yuma on January 2, 1996, to allow the City to construct operate and maintain a pathway along the East Main Canal from First Street to 40th Street. The City Police Department is to patrol pursuant to Attachment 1 to this Encroachment License, contained in **Appendix H** for information purposes. Unauthorized traffic, all terrain vehicles (ATVs), and other suspicious activity have been reported along this stretch of canal. The City of Yuma routinely receives and responds to a number of complaint calls about the unauthorized traffic on this part of the canal. A complaint number has been established that the public can use to report the license plate number of unauthorized or speeding vehicles on any unpaved roads.

YCWUA plans to expand the bike path and walkway to County 12 Street, but it estimates project completion in 5 years. A Yuma County Deputy Sheriff also works sixteen to twenty hours a week patrolling the canal roads under the jurisdiction of the YCWUA, all 400 miles of unpaved canal banks. In addition, YCWUA maintenance people prevent unauthorized traffic from using the canal roads. YCWUA and the Irrigation Districts also installed “No Trespass” signs and barricades in 1997 and added 50 signs in 1999 to discourage and prevent unauthorized vehicles on canal roads. Barricades have been installed at both sides of County 11 ½ and at County 13th Streets. Track-out resulting mostly from passenger cars is created where the canal roads link to the main roads. The YWCUA routinely waters and grades these roads, which mitigates dust emissions from this source.

YCWUA and the local Irrigation Districts have also reduced traffic on the unpaved canal roads by introducing weed-eating fish into the canals, obviating the need to use heavy equipment on these roads to remove weeds. YCWUA restocks the canals with 8,420 white amurs annually. YCWUA and the local Irrigation Districts added 7/8 of a mile of pipeline to the canal in 1995, 0.5 miles in 1996, 0.64 miles of canal in 1997, and 4 miles to the canal in 1999, which further reduces the need for weed control in the canals. YCWUA also restricts the unauthorized use of the canal roads. These entities also closed 1.2 miles of canal road in 1995 and 2.4 miles of canal roads in 1999. Emission reductions from these efforts 1991-2005 total **19.9 TPY.**

In the nonattainment area, the county roadways are primarily the section line roads, some of which are unpaved. Yuma County Public Works Department (YCPWD) has the legal responsibility to water, grade and compact the county unpaved roads in the Yuma Nonattainment Area. YCPWD can maintain, as a courtesy, public highways that were established by June 13, 1975, and all roads established by the Yuma County Board of Supervisors. The maintenance schedule varies from once every two weeks to once every two months, depending upon the daily traffic on the road. YCPWD increases its maintenance schedule during the vegetable growing season because the roads experience more use during that time. Unplanned unpaved roads are created in the Yuma Nonattainment Area by wildcat development and illegal lot splits. Wildcat subdivisions are on the Yuma Mesa. YCPWD does not have the legal authority to maintain these unpaved roads. Somerton waters the same 1211 miles of unpaved roads that it sweeps, but it does not apply chemical dust suppressants. Emissions reductions resulting from these watering and chemical stabilization programs 1991-2005 are estimated at **401 TPY**.

The agricultural producers water county unpaved roads during the growing season, in addition to the watering by YCPWD. The growers do this extra watering to prevent dust from these roads settling on their crops.

The most effective control measure for unpaved roadways is paving. Between 1991 and 1999, a combined **57.214 miles** of unpaved roads were **paved** in all of these jurisdictions and **21.5**

miles of unpaved road shoulders were **chip sealed.** Combined PM_{10} emissions reductions from these measures totaled **5,560 Tons** **(695 TPY 1991-1999)**. Between 2000 and 2004, an additional **82 miles** of unpaved road, alleys and shoulders were **paved.** Developers in Yuma County's jurisdiction added 12 miles per year of new paved roads during this period. Combined PM_{10} emissions reductions from these measures totaled **3,162 Tons** (**527 TPY 2000-2004)**.

The grand totals are 139.2 miles paved and 21.5 miles chip sealed 1991-2004. Combined PM_{10} emissions reductions from these measures totaled **8,722 Tons** (averaging out to **581 TPY 1991-2004**). These implemented unpaved road control measures far exceeded the SIP commitment of 216.6 TPY from 39.05 miles paved. The City of Somerton has also paved 35,720 feet of alleys 1994-2001.

Paving emission reductions are not viewed as TPY emission reductions. Instead, the Emissions Inventory has been adjusted to reflect the reduction of unpaved miles and the increase in paved miles. Annual emission reductions for control of dust on paved roads are reflected in street sweeping emission reduction calculations.

The Department of Homeland Security (known as the U.S. Immigration and Naturalization Service at the writing of the original SIP) also has unpaved roads under its jurisdiction. The Department agreed to reduce PM_{10} attributable to dragging unpaved roads to imprint the footprints of illegal aliens entering the United States and to water 348.5 miles of gravel roads.[17]

MCAS has a stabilization program for its remaining unpaved roads and also prevents unauthorized vehicles from using unpaved roads on the air station. Each year during the 2002–2005 timeframe, it restricted flight line vehicle access onto 4 miles of unpaved roads on the air station. Beginning in 2002, it maintains speed limit signs limiting the speed on a six mile stretch of unpaved road to 15 miles per hour.

6.3.4 Unpaved Parking Areas

The Cities of Yuma and Somerton committed to controlling dust from a total of 33 unpaved parking lots. Effective February 1979, the City of Yuma has had a zoning requirement that all new parking lots must be paved in Section 154-396 (E). Effective October, 1997, Yuma County Planning and Zoning Ordinance Part A §906.00 has required that all new parking lots must be paved.

A Memorandum of Agreement (MOA) between the Marine Corps Air Station (MCAS) and ADEQ was entered into in late 1992. The MOA and ordinances are in **Appendix H** for information purposes. MCAS agreed to paving commitments. Between 1991 and 1999, **201,250 square feet** of parking lots were **paved,** resulting in **2.6 Tons** **(0.3 TPY 1991-1999**) PM_{10} emission reductions. Between 2000 and 2005, an additional **894,750 square feet** of unpaved parking lots and roads were **paved**. An additional **11.3 Tons** (**2.3 TPY 2000-2005**) PM_{10} emission reductions resulted.

[17] This information was obtained through personal communication between ADEQ staff and Homeland Security personnel.

Total paving of previously unpaved parking lots is **1,096,000 square feet 1991-2005.** PM_{10} emissions reductions from these measures totaled **<u>13.91 Tons</u>** (**1.7 TPY 1991-2005**).

The jurisdictions chemically stabilized 13 other parking areas, resulting in **<u>4.9 Tons</u>** of reductions. Effective October, 1997, Yuma County Planning and Zoning Ordinance Part B §906.00 has required private sector chemical stabilization with dust-inhibitor treated ABC of parking lots with more than 6 but less than 25 parking spaces The zoning requirements are contained in **Appendix H** for information purposes and on Yuma County's web site.

Adding the emissions reductions from paving and stabilizing unpaved parking areas in Table 6.3 results in a combined **grand total** reductions of **18.8 Tons** (**1.4 TPY**) **from paving and chemical stabilization** were achieved. Details appear in Table 6-3.

6.3.5 Travel Reduction Strategies

Several strategies are described in the MOA between MCAS and ADEQ entered in late 1992. The MOA is in **Appendix H** for information purposes. MCAS worked with the City of Yuma to create a bicycle path from MCAS to Yuma for the purpose of reducing motor vehicle trips. MCAS constructed all 3 miles of bicycle path in 1995. MCAS provides bicycles free of charge to personnel on the installation. MCAS estimated that **2,600** cars were eliminated on their installation 1995-2003 as a result of issuing bicycles to messengers.

MCAS has also required carpooling for all administrative trips and other off-station trips beginning in 1991. MCAS estimates that off-station trips were reduced by 11,700 cars per year as a result of carpooling and 780 cars a year were eliminated from making off-station trips during the 1995–2005 timeframe.

This control measure has been fully implemented. <u>Emissions reductions achieved from these strategies total **4.8 TPY**.</u>

The 1994 SIP commitment estimated 14.9 TPY PM_{10} reductions from this measure. The 10.1 TPY shortfall has been offset by the surplus emission reductions from the paving measures implemented as described in 6.3.3 above. In addition, the Yuma region has a mass transit system. Yuma Metropolitan Planning Organization (YMPO) informed ADEQ that in 2004, the ridership on the region mass transit system increased 88.9%.

6.3.6 Covered Haul Trucks

Yuma County Resolution **91-38** adopted a fee schedule for uncovered trucks taking loads to the Sanitary Landfill, effective in 1992. Yuma County dedicated these fees for cleanup of materials that have fallen out of uncovered trucks en route to the landfill, including PM_{10}. Fee collection was subsequently repealed. The City of Yuma Ordinance No. **2638** requires haul trucks to be covered or tarped to prevent materials from becoming airborne. A copy is in **Appendix H** for information purposes.

Law enforcement personnel for the municipalities concluded, after consultation with their legal representatives, that A.R.S. § **28-1098 (formerly -1873)** and **R18-2-606** do not provide them with sufficient authority to pursue enforcement for each such truck. These jurisdictions plan to pursue legislation to add language they need. This strategy has not been fully implemented.

The 13.4 TPY estimated for this control measure has been obtained instead through surplus emission reductions from the paving measures implemented as described in 6.3.3 above.

6.3.7 Temporary Sources of Dust on Paved Roads

The Cities of Yuma and Somerton and Yuma County committed to providing for traffic rerouting and rapid cleanup of sources of dust on paved roads within their respective jurisdictions by December 10, 1993, in Resolutions that appear in **Appendix H** for information purposes. The control of this source of dust was achieved through the adoption of quick cleanup policies emphasizing the importance of avoidance of spills, quick notification, and rapid cleanup. Table 6-3 shows an estimated **13.4 TPY** PM_{10} reduction has been achieved from this source category since 1994.

The Cities of Yuma and Somerton and Yuma County have operated street sweeping programs for years, above and beyond the commitment made in the 1994 SIP. The City of Yuma program began 35 years ago and includes watering. The City swept 1183 miles on paved roads each year during the 1995–1999 timeframe, reducing re-entrained road dust emissions by **0.35 TPY**. Currently, the City of Yuma owns a total of six street sweepers. Four are PM_{10} certified Elgin/Broombear street sweepers from two to five years old and two are standard street sweepers. Three PM_{10} certified sweepers and the two standard street sweepers are operated one shift daily, five days/week. The five street sweepers run forty hours a week and are also operated during special call outs and events on an "as needed" basis. The fourth PM_{10} efficient street sweeper costing $167,000 was partially funded by a $25,000 grant from ADEQ's Division of Water Quality in 2005. It will serve as a spare held in reserve in case one of the others is out of service. The City of Yuma Department of Public Works Street Sweeping Plan is included in **Appendix H**. The City of Yuma sweeps 292 miles of paved roads at the frequencies described in its Street for information purposes Sweeping Plan. An average of 17,128 miles are swept annually, resulting in emissions reductions of **64 TPY.**

The City of Somerton owns one street sweeper that is not PM_{10} efficient and intends to replace it in 2008 with a street sweeper that is PM_{10} efficient. Its newest sweeper, standard, was purchased in March 2000. Somerton's records begin with 1998. Starting in 2001, Somerton has swept at least 2500 miles each year, resulting in emissions reductions of **0.38 TPY**.

Yuma County owns one PM_{10} efficient street sweeper and spends approximately $50,000 per year on street sweeping operations. The County swept **3,238** miles each year during the 1997–1999 timeframe resulting in emissions reductions of **1.0 TPY**.

MCAS also has a street sweeping program. Its street sweeping equipment is operated in a manner that minimizes dust, including using water during operations. During the 1995–2005 timeframe, MCAS **swept 1,628,643 square yards/year** of the airfield on the installation. Combined PM_{10} emission reductions from the municipalities and MCAS total **1.1 TPY**.

STREET SWEEPING				
Jurisdiction	Years	Duration	Tons/Year	Total Tons
City of Yuma	1995-1999	5	0.35	1.75
City of Yuma	2000-2005	6	64.00	384.00
City of Somerton	1998-2005	6	0.38	3.04
Yuma County	1997-1999	3	1.0	3.0
MCAS	1995-2005	11	1.1	12.1
TOTALS			37	403.89

Grand total emission reductions from these control measures beginning in 1995 are estimated as **404 Tons**, with an average reduction of **0.637 TPY**.

6.3.8 Dust Control Plans for Construction Land Clearing

The jurisdictions of Yuma, Somerton, and Yuma County have all adopted local laws that require some level of dust mitigation during construction projects.

Yuma County adopted Resolution 88-28 effective July 18, 1988. Yuma County requires in Section 201.3 Dust Control that contractors on County projects apply dust palliatives to areas where dust could be disturbed by construction or traffic activities. In Yuma County Resolution No. 98-65 adopted in August 1998, Yuma County adopted Amendments to its Comprehensive Building Codes. Section 3309.11 requires that a dust control plan be submitted to the Building Official prior to construction.

Prior to submittal of the 1994 SIP, the City of Yuma adopted the Uniform Building Code, 1991 Edition, including certain appendices. The appendix concerning grading activities includes a dust control plan requirement that is in Section 3304.2 of Chapter 150, Title 15 of the City of Yuma Code. The City of Yuma also adopted Ordinance No. 098-24 effective in 1998. Building permits for projects in the City of Yuma can be obtained through either the Zoning Department or the Public Works Department, depending upon the type of project. In each case, local law requires submittal of a dust control plan to the Building Official.

Somerton's requirement for dust control plans for construction is similar to the requirement for the projects in the unincorporated portions of Yuma County. The City of Somerton adopted Ordinance No. 300 in 2005, which requires an Erosion and Sedimentation Control Plan. Copies of these requirements are in **Appendix H** for information purposes. Arizona Department of Transportation (ADOT) often hires contractors for road construction projects in the Yuma PM_{10} Nonattainment Area. ADOT requires its contractors to adhere to local dust control plan requirements. An estimated reduction of **5.4 TPY** of PM_{10} per year has been achieved through this measure from 1994 to date.

6.3.9 Control of Dust on Open Land

The 1992 MOA with MCAS requires MCAS to control dust emissions from a total of ten acres on its installation. MCAS has adopted MCAS Natural Resources Management Plan—1990 and pages 3-1 and 3-18, concerning dust control from disturbed land areas, is specifically referenced in the MOU. Table 6.3 indicates that an estimated PM_{10} reduction of **0.1 TPY** is achieved from this category, not including further reductions discussed below.

MCAS has also constructed buildings on formerly vacant land with disturbed soils. MCAS constructed a medical facility and clinic installation in 1996 and other buildings in 1996 and 1998. As a result of construction, permanent reductions of **0.43 TPY** PM_{10} emissions from **102,141** square feet of formerly open land have been achieved.

In 2003, MCAS paved 750,000 square feet of open ground surrounding the air field with asphalt and developed 2,522,500 square feet of open ground. It developed 85,579 square feet of open ground in 2005.

MCAS informed ADEQ that it landscaped 464,689 square feet of wind erodible land with native plants to prevent or control windblown dust in 1999 and landscaped 39,860 square feet in 2004. MCAS cropped or mowed plants on 63 acres, rather than completely removed, on 63 acres each year 1995–2005.

MCAS also used dust palliatives or liquid surfactants to control dust on its open land. MCAS prevented cars from accessing and parking at selected locations on the air station. MCAS controlled soil erosion onto paved road surfaces. MCAS informed ADEQ that it has built 98 storm water retention basins on the installation since 2002. MCAS informed ADEQ that it trained 735 people in air quality issues in 2004 and 560 personnel in 2005.

Grand total emission reductions from all of these strategies are estimated as **22.3 TPY**.

Since 1974, YPG has operated as a major range and test facility for the Department of Defense pursuant to Public Land Order 848 dated July 1, 1952 and Public Land Order 8476 dated September 28, 1983. It is viewed as "ideally suited for testing military equipment, weapons, vehicles, and aviation systems in desert environments" according to the Final Range Wide Environmental Impact Statement, July 2001, U.S. Army Yuma Proving Ground (EIS). Although YPG covers 1300 square miles, only a small portion of YPG is in the Yuma air quality planning area. Figure 9 from the EIS delineates this area and is included in **Appendix H** for information purposes. In addition, the U.S. Army Yuma Proving Ground (YPG) undertakes measures to minimize PM_{10} emissions from federal activities on its premises. ADEQ has been unable to locate an executed copy of a June 28, 1994, MOU prepared for signature. According to its January 10, 2002, report on implemented RACMs, beginning in 1997 YPG has graded and **watered approximately 11.7 million square feet of unpaved roads annually**. In May 2005, YPG reported its expenditures on RACMs from 1991-1994 as $840,800; for 1995-1999 as in excess of $1.3 million; and 2002-2004 as $927,163. YPG's RACM reports are included in **Appendix G**.

In addition, YPG is fenced to bar access by unauthorized personnel. Even authorized personnel are restricted to access on only a small portion of YPG, for the most part. The Yuma Proving Ground Hunting Program brochure explains that all off-road use of motorized vehicles is prohibited, and vehicle access is restricted to existing roads and developed trails. Hunting is allowed only by holders of permits issued annually by YPG. Hunting is allowed during dove and quail season (September 1 through February 12th annually). The brochure shows the area where hunting is allowed, and a copy of it is included in **Appendix H** for information purposes. No emissions reductions have been modeled for YPG's control measures. Estimated emission reductions from these measures are **465 TPY**.

Section 118 of the Clean Air Act provides that Federal Facilities "shall be subject to, and comply with, all State and local requirements respecting the control and abatement of air pollution in the same manner, and to the same extent as any nongovernmental entity. The preceding sentence shall apply (A) to any requirement whether substantive or procedural (including any recordkeeping or reporting requirement, any requirement respecting permits and any other requirement whatsoever)…." However, the President may exempt any emission source from such requirements, other than compliance with Section 111 of the Act, upon making a determination that it is in the paramount interest of the United States to do so. Neither MCAS nor YPG have been exempted as of May 2006, according to EPA Region IX.

Table 6-3. 2000-2004 Yuma Area Implemented Control Measures and PM_{10} Emission Reductions (Tons per Year)

Agency	Projects	Year	Tons	2000	2001	2002	2003	2004
City of Yuma	Pave unpaved roads	2000	1059	5.74 mi				
		2001	550		2.98 mi			
	Pave unpaved alleys	2000	3.5	0.83 mi				
		2001	3.5		0.83 mi			
	Paving unpaved vacant land		1.1				6835 sq yds	
	Chemically stabilize Unpaved roads	2001	4.1		1.0 mi			
		2002						
		2003	39				44287 yds	
		2004	77					88575 yds
	Watering shoulder	2001	0.1		5436' of 8' shoulder			
	Street sweeping Paved roads	2000	54	17128 mi				
		2001	54		171218 mi			
		2002	54			17128 mi		
		2003	54				17128 mi	
		2004	54					17128 mi
		2005	54	17128 mi				
	Install curbs & sidewalks	2000	8	0.63 mi				
		2001	122		10.14 mi			
	Landscaping median	2000	0	5.74 mi				
	Magnesium chloride on Alleys	2003	3.8				87930 sq yds	
		2004	3.8					87930 sq yds
	Magnesium chloride on City property	2003	1.9				63852 sq yds	
		2004	1.9					63852 sq yds

Agency	Projects	Year	Tons	2000	2001	2002	2003	2004
City of Somerton	Water unpaved roads	2000	511	400 mi				
		2001	511		400 mi			
		2002	None rptd					
		2003	1247				1211 mi	
		2004	1247					1211 mi
	Water unpaved Shoulders	2000	0.1	1820 mi				
		2001	0.1		1820 mi			
	Street sweeping							
		2000	4.3	1376 mi				
		2001	10.4		3286 mi			
		2002	9.1			2888 mi		
		2003	8.4				2662 mi	
		2004	8					2548 mi
		2005	9.2	2918 mi				
	Pave unpaved roads	2002	830			4.5 mi		
	Weekly cleanup of paved roads, mud, trackout, spills	2000	3.6	52				
		2001	3.6		52			
		2002	3.6			52		
		2003	3.6				52	
		2004	3.6					52
	Pave unpaved lots(ft2)	2002	6.41			505,440		
	Landscape shoulders (mi)	2002	5.5			0.5 mi		
	Install curbs (mi)	2002	11			1.0 mi		
		2003	13.7				1.25 mi	
		2004	2.7					0.25 mi
	Pave/stabilize unpaved roads	2001	138		0.75 mi			
		2003	185				1.0 mi	
		2001	138		0.75 mi			
	Chip/sealed	2000	17	56.2 mi				

Agency	Projects	Year	Tons	2000	2001	2002	2003	2004
	Magnesium chloride on Unpaved roads	2001	17		56.2 mi			
		2004	19					64 mi
	Street Sweeping							
		2000	0.32	100 mi				
		2001	0.63		200 mi			
		2002	0.95			300 mi		
		2003	0.63				200 mi	
		2004	0.55					175 mi
Yuma County	Pave unpaved roads	2000	73.58	1.0 mi				
		2001	73.58		1.0 mi			
		2002	73.58			1.0 mi		
		2003	73.58				1.0 mi	
		2004	73.58					1.0 mi
	Developers add new paved roads	2000	883	12.0 mi				
		2001	883		12.0 mi			
		2002	883			12.0 mi		
		2003	883				12.0 mi	
		2004	883					12.0 mi
	Chip/sealed unpaved roads	2001	138		0.75 mi			
	Magnesium chloride unpaved roads	2000	17	56.2 mi				
		2001	17		56.2 mi			
		2002	18			61.6 mi		
		2003	17				56.7 mi	
		2004	19					64 mi
	Street Sweeping	2000	10	100 mi				
		2001	23		200 mi			
		2002	35			300 mi		
		2003	23				200 mi	
		2004	20					175 mi

Agency	Projects	Year	Tons	2000	2001	2002	2003	2004
Immigration and Naturalization Service		2000	7.1	18 mi				
		2001	7.1		18. mi			
		2002	7.1			18 mi		
		2003	7.1				18 mi	
		2004	7.1					18 mi
		2000	3.35	Restock				
		2001	3.35		Restock			
		2002	3.35			Restock		
	Water drag roads	2003	3.35				Restock	
		2004	3.35					Restock
		2000	2	2 mi				
		2002	0.84			0.8 mi		
	Pipelined	2003	0.53				0.5 mi	
	Maintain 350 "No Trespassing" signs & 50 barricades							
		2000	10	Enforcement				
		2001	10		Enforcement			
	Patrol & water unpaved canal roads	2000	82	400 mi				
		2001	82		400 mi			
		2002	82			400 mi		
		2003	82				400 mi	
		2004	82					400 mi
	3 mi posted/barricaded	2001	4.2		3 mi			
	Paved 2.5 mi		5		2.5 mi			
	1.5 mi fenced off		2.1		1.5 mi			

Agency	Projects	Year	Tons	2000	2001	2002	2003	2004
	Abandoned 3/8 mi							
		2003	1.3				2.6	
	Lined 8 mi of canal	2004	8.4					17.8
N. Gila Irrigation	20 miles posted	1999	0					
District								
Unit B Irrigation	3 mi posted/barricaded	1999	0					
District								
Bureau of Reclamation	Water 960 miles of canal banks	2003	54				960 mi	
		2004	54					960 mi
Marine Corps Air Station	Remove 26 gas							
	Vehicles	2000	0.06	0.06				
	Remove 15 gas							
	Scooters	2001	0.02		0.02			
	Pave 140329 ft2 roadway	2003	1.4				70165 ft2	70165 ft2
		2004	1.4				51056 ft2	51056 ft2
	Pave 102112 ft2 parking	2003	0.2					
		2004	0.2					
	Sweeping 717221 yd2 runway							
	Sweeping 388952 yd2 taxiway							
	Sweeping 401090 yd2 aprons and 121,380 yd2 other		1.1/Year					
	Sweeping Totals							
	Stabilize desert		0.1	25,726 ft2			2,533,500 ft2	
Total TONS				3604	3495	2866	2293	3384

6.3.10 Permanent and Enforceable Reductions

The 1994 SIP estimated that attainment would be achieved with emission reductions of 393.00 TPY. ADEQ has concluded that the control measures implemented 1991-2005 have achieved significantly greater emission reductions than required and that these measures have been completed. Furthermore, with the exception of paving unpaved roads, these emission reductions were not incorporated into the 1999 or 2016 Emission Inventories that formed the basis for the modeling maintenance demonstration. The predicted concentrations, already roughly 20% below the NAAQS, would have been even lower had these reductions been taken into account. In the Averaged Tons Per Year Reductions Table below, 1530 TPY for the period 2000-2005 result from control measures that were not subtracted from the 2016 Emission Inventory. The effectiveness of these emission reductions have been borne out at the ambient air monitor, which has shown attainment for over ten years. EPA has published a Clean Data Finding, and a modeled attainment demonstration is no longer required. Agricultural Best Management Practices are not included in either the Total Tons Reduced Table or the Tons Per Year Reductions Table.

TOTAL TONS REDUCED			
CONTROL MEASURE	1991-1999	2000-2005	TOTAL TONS REDUCED
Paving and chip sealing unpaved roads	5,560	1,610	7,170
Watering unpaved roads	2,234	3,808	6,042
Restricted open burning of agricultural acreage	1,758	1,855	3,613
Sweeping streets and runways	23	1,242	1,265
Canal roads dust control	68	672	740
Chemically stabilize unpaved roads	84	288	372
Construction project dust control	32	27	59
Open land dust control	0.4	52	52.4
Stabilizing unpaved parking lots	2.6	11.3	13.9
TOTAL TONS Reduced	9,762	9,565	19,327

The Average Ton Per Year Reductions Table appears on the next page.

AVERAGED TON PER YEAR REDUCTIONS			
CONTROL MEASURE	1991-1999	2000-2005	1991-2005
Paving and chip sealing unpaved roads	618	322	512
Watering unpaved roads	248	762	432
Restricted open burning of agricultural acreage	195	371	258
Sweeping streets and runways	3	248	90
Canal roads dust control	8	134	53
Chemically stabilize unpaved roads	9	58	27
Construction project dust control	4	5	4
Open land dust control	0	10	4
Stabilizing unpaved parking lots	0	2	1
COMBINED REDUCTIONS	1,085	1,913	1,381

6.4 Maintenance Demonstration Control Measures

All of the control measures described above that have been implemented to attain the PM_{10} standard will continue throughout the maintenance period. Yuma's economy depends in part on a large influx of winter residents from cooler climates, many of whom are members of sensitive populations especially vulnerable to adverse impacts on the respiratory system. It is in Yuma's economic interest to maintain good air quality in order to continue to attract these residents, many of whom arrive in recreational vehicles and could easily choose other winter locations.

Paving and chip sealing unpaved roads; watering unpaved roads; and chemically stabilizing unpaved roads will continue at the current rate so long as funding remains available, as demonstrated by longstanding practices of the jurisdictions within the Yuma air quality planning area. Highway funds are distributed and projects prioritized through the Yuma Metropolitan Planning Organization process. Longstanding Planning and Zoning ordinances requiring dust control plans and paving of parking lots will remain in effect or become more stringent as the Yuma area grows. Construction project dust control plan requirements will continue to be enforced locally, and all new developments are required to pave associated new roads to prevent new problems from developing. Current dust control practices on canal roads are both cost effective and efficient for the YCWUA and Irrigation Districts to employ, including fish restocking and adding pipeline. The MCAS bicycle path built in 1995 will remain in place and in use, and trip reduction strategies in use at MCAS save money that would otherwise be spent on fuel and vehicles. The cap on agricultural wheat stubble burning has not been exceeded for several years, and agricultural land continues to be converted permanently to residential property for housing construction. Street sweeping has been particularly rigorous, and remaining standard sweepers will be replaced by PM_{10} efficient sweepers.

Yuma area stakeholders have also committed to additional control measures initially included in a Natural Events Action Plan. These additional control measures will be implemented through 2016. These additional measures are described below.

6.4.1 Yuma Natural Events Action Plan (NEAP)

On August 18, 2002, the Yuma area experienced a 24-hour average PM_{10} concentration of 170 μg/m^3. The 24-hour average PM_{10} NAAQS is 150 μg/m^3. An unusually large and intense thunderstorm developed in east-central Sonora, Mexico, on the afternoon of August 18, 2002. By evening, the thunderstorm had moved to the northwest through the Yuma area, producing sustained winds in excess of 25 miles per hour with gusts up to 45 miles per hour.[18]

High wind events are one type of natural event covered by EPA's Memorandum entitled "Areas Affected by PM-10 Natural Events" dated May 30, 1996, authored by Mary D. Nichols, and known as EPA's Natural Events Policy (NEP). Pursuant to the NEP, Arizona adopted Policy 0159.00 Air Quality Exceptional and Natural Events and a companion Technical Criteria Document. Under these policies, ADEQ developed a Natural Events Action Plan (NEAP) to reduce particulates during future high wind events in the Yuma area. The NEP requires that NEAPs include commitments to five elements:

- Establish public notification and education programs
- Minimize public exposure to high concentrations of PM-10 due to future natural events
- Abate or minimize appropriate contributing controllable sources of PM-10
- Identify, study and implement practical mitigating measures as necessary
- Periodically reevaluate the effectiveness of the NEAP at least every 5 years.

The NEP provides:

> "Programs to minimize PM-10 emissions may include:…(c) High winds – application of BACM [Best Available Control Measures] to any sources of soil that have been disturbed by anthropogenic activities. The BACM application criteria require analysis of the technological and economic feasibility of individual control measures on a case-by-case basis. The NEAP should include analyses of BACM for contributing sources…If BACM are not defined for the anthropogenic sources in question step 4 below is required." (emphasis added)

Step 4 is the requirement to study practical mitigating measures.

[18] Wind speeds of 15 miles per hour and greater can suspend surface soil dust into the air.

The NEP required ADEQ to submit a NEAP to the U.S. Environmental Protection Agency (EPA) by February 18, 2004 (eighteen months after the exceedance) and a NEAP Implementation Report by August 17, 2005.

6.4.2 Yuma Public Notification and Education Program

ADEQ assisted stakeholders in Yuma County, including the Cities of Yuma and Somerton, in the development a public notification and education program as part of a specific NEAP commitment. Yuma residents identified key stakeholders in the Yuma area to be included in this program. The program focuses on alerting sensitive segments of Yuma's population to potential health threats from exposure to high concentrations of PM_{10} that can trigger asthma, bronchitis, severe coughing, heart attacks, and other life threatening upper respiratory problems if exposed through air quality health forecasts distributed through the media, on local web sites, and distribution by the ADEQ Community Liaison to school nurses, daycare centers, and senior centers. To this end, ADEQ and Yuma entities developed an Outreach and Notification Resource List included in **Appendix E** of this plan. The air quality health forecasts are utilized by the media, daycare centers, senior centers, and schools to enable these populations to minimize their exposure to dust in the event of a high-wind event that could increase concentrations of PM_{10}.

In addition, the Cities of Yuma and Somerton, along with Yuma County, developed dust complaint hotlines for citizens to report violators [Yuma: (928) 327-4500, Yuma County: (928) 217-3878, Somerton: (928) 627-9876]. Yuma County maintains a computer log of all complaints received. ADEQ assisted with the development of educational materials, including the bi-lingual brochure. These materials are disseminated by ADEQ's Community Liaison for the Southwest region in concert with Yuma County public service announcements, planned speaking events, and other information posted to local and State web sites where it can be downloaded for further dissemination. The ADEQ Web site containing these materials is http://www.azdeq.gov/function/education/index.html. The hotline number mentioned in the Yuma NEAP evolved, during the stakeholder process, into the various complaint numbers listed for the entities in Yuma on the public information pamphlet, *How Can I Protect My Family in Yuma from Dust Pollution* (see **Appendix D**). The pamphlet is available in both English and Spanish. Any Yuma area citizen can phone in a complaint to the number listed on the pamphlet for the jurisdiction in which he resides. The hotline numbers and the publication of the bi-lingual information pamphlet were a result of the high wind event on August 18, 2002.

In 2005, Yuma County developed a public service announcement (PSA) that is played on public access stations. The PSA warns Yuma area residents of the health hazards of dust and encourages them to find ways to control dust and minimize their exposure to it. Yuma County also developed an informational brochure. The brochure can be viewed at Yuma County's website: http://www.co.yuma.az.us/dds/EP.htm. This website is devoted to educating the public regarding air quality issues.

Although quantifiable emission reductions are not attributed to this program, it will continue throughout the maintenance period.

6.4.3 Minimization of Public Exposure during Future Natural Events

A 3-day Dust Control Action Forecast is sent to potential sources of dust when the 3-day forecast predicts conditions conducive to elevated dust levels so that they can minimize emissions and reschedule dust-producing activities. An example is in **Appendix F**. These forecasts address minimization of appropriate contributing controllable sources. Dust Control Action Forecasts are distributed by the Arizona Department of Agriculture to Yuma area farmers and by the ADEQ Community Liaison to City of Yuma, City of Somerton, and Yuma County Public Works Departments and to building construction contractors. These forecasts that reduce dust disturbance during wind-generated dust events combined with the public notification program described in 6.4.2 minimize public exposure to particulate matter. Although quantifiable emission reductions are not attributed to this program, it will continue throughout the maintenance period.

6.4.4 Abatement or Minimization of Appropriate Contributing Controllable Sources

A. <u>NEP Compared to Best Available Control Measures (BACMs) Guidance</u>

Section 189 of the Act requires BACMs for Serious PM_{10} nonattainment areas to reduce emissions from all "significant" contributing sources to a PM_{10} exceedance. EPA was required by Section 190 of the Act to issue BACM Guidance within 18 months after November 15, 1990. EPA published an Addendum to the General Preamble for the Implementation of Title I of the Clean Air Act Amendments of 1990[19] in the Federal Register on August 16, 1994. Section VI of the Addendum, entitled "Best Available Control Measures" explains that *for Moderate areas reclassified as Serious*, "the nonattainment control requirements (i.e., RACM) are carried over and elevated to a higher level of stringency (i.e., BACM). So, by analogy, just as RACM includes RACT, in the same way, BACM includes BACT." Section VI then quotes statements in H.R. Rep, No. 490, 101st Cong., 2nd Sess. 266-67 (1990) concerning BACM for Serious areas: "Such provisions must include the application of the best available control technology to existing stationary sources."

Section VI. provides that "Therefore, under this policy, a source category (see footnote 33) will be presumed to contribute significantly to a <u>violation</u> of the 24-hour NAAQS if its PM-10 impact at the location of the expected violation would exceed five $\mu g/m^3$" or if "its PM-10 impact at the time and location of the expected annual NAAQS <u>violation</u> would exceed one $\mu g/m^3$." (emphasis added) Footnote 33 explains that source categories for which BACM will be required refers to categories of area-wide sources or of large individual stationary sources. Under EPA's presumptive policy, sources that contribute less particulate matter are presumed to be de minimis contributors to a violation.

Yuma is classified as a Moderate PM_{10} area and has never been classified as a Serious PM_{10} area. The NEP provisions related to BACM are not identical to the BACM requirements for Serious PM_{10} areas. The NEP requires that an area that has flagged data due to a high wind

[19] Federal Register, FRL-5052-2, August 16, 1994.

event must commit to abate or minimize appropriate contributing controllable sources of PM_{10} and provides that the area “may” apply BACM to sources of soil disturbed by anthropogenic activities to meet the abatement requirement. If BACM are not defined for the anthropogenic sources, then the State must identify, study, and implement practical mitigating measures as necessary. The NEP does not expressly require the application of BACT to existing stationary sources to meet the abatement requirement. The largest stationary source of PM_{10} in Yuma emits less than 19 tons per year and is not subject to BACT.

The elevated PM_{10} concentration in Yuma on August 18, 2002, was an exceedance of the standard, not the last in a series of exceedances that constitute a violation.

B. BACM Analysis Procedures

EPA’s BACM Guidance outlines required steps for the analysis. The first step in the BACM analysis is to develop a detailed emissions inventory of PM_{10} sources and source categories.

The second step requires evaluating source category impacts using the emission inventory in air quality modeling to evaluate the impact of the various sources and source categories on PM_{10} concentrations above the standards to determine which have impacts above de minimis levels.

The third step entails identifying potential BACMs. In identifying these BACMs, the technical feasibility of potential controls for source categories with impacts greater than de minimis levels must be considered. Because of varying factors, such as the mix of sources, including nonanthropogenic sources, population exposure, and availability of controls, the set of control measures must be individualized for the specific conditions in each nonattainment area. When evaluating technological feasibility, States must document selection of BACMs by showing what control measures applicable to each significant source category were considered. The control measures selected should preferably be measures that will prevent PM_{10} emissions rather than temporarily reduce them. The documentation should compare the control efficiency of technologically feasible measures, their energy and environmental impacts and the costs of implementation.

The fourth step is evaluation of the costs of the potential BACMs. When evaluating economic feasibility, a State should not restrict analysis to simple acceptance/rejection decisions based on whether full application of a measure to all sources in a particular category is feasible. A State should consider implementing a control measure on a more limited basis, for example, for a percentage of the sources in a category if it is determined that 100 percent implementation of the measure is infeasible.

Finally, BACM is to be selected for area sources and BACT is determined on a case-by-case basis for any stationary source category with impacts greater than de minimis levels.

C. Determination of Appropriate Contributing Controllable Sources

1. Determination for NEAP Development

ADEQ modeled August 18, 2002 using Industrial Source Complex Short Term 3 (ISCST-3) to identify the major contributing sources to the observed exceedance on that day. This modeling was based on windblown emissions for those hours where wind speed exceeded the 15 mph dust suspension threshold, as estimated for a high wind day from the Yuma PM_{10} maintenance plan modeling (March 31, 1999). The Yuma NEAP contains a detailed look at PM_{10} contributions from windblown dust on August 18, 2002.

Figure VI-1 of the NEAP showed that 41% of the ambient PM_{10} during the wind-generated dust event on August 18, 2002, came from human activity. Figure VI-3 of the NEAP showed a breakdown of contributing human activities: 69% from on-road vehicles; 25% from construction, and 4% from unpaved roads. Other sources, including stationary sources, were determined to contribute less than 1%.

Figure VI-2 of the NEAP provided a breakdown of the other 59% that came from windblown dust on that date: 25% from unpaved roads; 30% from agricultural fields; 18% from urban disturbed areas; and 27% from other disturbed areas. The information produced by the modeling guided Yuma stakeholders in selecting control measures for appropriate contributing controllable sources.

2. Determination for Maintenance Plan Development

The following conclusions were derived from the technical analyses contained in the TSD, including the emission inventory. The main sources of PM_{10} for windblown dust are vacant agricultural fields at 51%, miscellaneous disturbed areas at 26%, and unpaved agricultural roads at 17%. The main sources of PM_{10} emissions on low-wind days are unpaved roads at 42%, road construction at 28%, agricultural tillage at 15%, and re-entrained dust from paved roads at 14%.

D. List of Potential BACMs and Economic Feasibility

A total of thirteen stakeholder meetings beginning on June 4, 2003, and ending on August 4, 2005, were held to develop and implement the Yuma NEAP, during which these BACMs were identified and selected. The sign-in sheets for these stakeholder meetings are contained in the NEAP appendices. The BACMs selected for Yuma are described below. The deadline for full implementation of BACMs pursuant to the NEAP was August 18, 2005. The candidate lists of BACMs considered by Yuma stakeholders was the BACM list completed for the Salt River PM_{10} SIP included in Appendix G of the Yuma NEAP and the BACM list complied for ADEQ's Exceptional and Natural Events Policy in June, 2001, included in **Appendix I** of this Maintenance Plan. These Arizona BACM lists were the starting point for determining BACMs to be used in Yuma County. Yuma stakeholders relied on the cost effectiveness analysis contained in the MAG "1999 Serious Area Particulate Plan for PM-10." EPA noted in its proposed approval of that SIP that "Overall, the plan presents one of the most comprehensive lists of potential BACM ever produced." 66 FR 50258. Information specific to Yuma is included in each measure discussed below.

E. Evaluation of Technological Feasibility for Yuma and Selected Abatement Measures

1. Construction Sources

a. Existing Control Measures

Arizona Administrative Code **R18-2-604.A.,** initially adopted effective May 14, 1979, and updated in 1990 and 1993, requires persons constructing, repairing, altering, or demolishing a building or preparing to do so on an urban or suburban open area or conducting earth moving or excavation activities to limit excessive amounts of particulate matter from becoming airborne through the use of approved dust suppressants, adhesive soil stabilizers, paving, covering, landscaping, continuous wetting, barring access or other means. ADEQ enforces this rule within the Yuma air quality planning boundaries.

All three jurisdictions have Dust Control requirements that apply to construction sites. The City of Yuma Ordinance No. **098-24** requires a Plan to control dust on *all* construction sites. This requirement is more stringent than the Maricopa County Rule 310 BACM size threshold of 0.10 acre or more. Public Works Standards for Yuma County, Volume II, Sections **201.3** and **204.4** require contractors working on County projects to apply water and dust palliatives to control dust during all construction and related traffic. The City of Somerton adopted Ordinance No. **300**, in 2005, which requires an Erosion and Sedimentation Control Plan, as discussed in 6.3.8 above. Copies of these ordinances are in **Appendix H** for information purposes.

b. Selected Abatement Measures for NEAP and BACM Technological Feasibility for SIP

ADEQ and the Yuma area stakeholders conducted four meetings (on June 15, 2004; August 25, 2004; September 21, 2004; and October 27, 2004) to discuss a Project Information Sign requirement for construction projects. Over the course of the meetings, existing local laws that required dust mitigation plans to be in effect during construction projects were reviewed as was the list of potential BACMs. The selected measure for further controlling emissions from constructions sites is designed to improve compliance with existing dust control plan requirements, defined as BACM in Maricopa County Rule 310 and Clark County, Nevada, Table 4-14. ADEQ worked with the Cities of Yuma and Somerton and with Yuma County to add a Project Information Sign requirement for all construction projects one acre or more in size. This size cutoff is more stringent than the Clark County, Nevada, size threshold of 10 acres or greater in size for such signs, listed in its Table 4-14 BACM Control Measures. These signs must include the applicable Dust Complaint Hotline number so that citizens can report dust problems to the appropriate jurisdiction for followup.

More stringent measures were not selected because Yuma has experienced only a single exceedance in a period of more than a decade.

City of Yuma Ordinance No. **O2004-72** requires the owner and/or operator to erect and maintain a Project Information Sign, in accordance with Standard No. 8-100, Work Zone Identification Sign, Sign WZIS-1, of the City of Yuma Construction Standard Detail Drawings, that is readable by the public at the main entrance for all sites with a building or grading permits that are one acre or larger, except for routine maintenance. The City of Yuma has dedicated one staff person to enforce this ordinance. The City of Yuma Public Works and Community Development Department is responsible for the implementation and enforcement of this requirement, which became effective in 2004. This ordinance is enforced along with local stormwater regulations for construction sites, which also address dust generation from construction sites.

The City of Somerton adopted Article **9-6-1** of Resolution No. **907**, effective in 2005, which requires the owner and/or operator to erect and maintain a Project Information Sign, in accordance with Exhibit A (Work Zone Identification Sign Details) of the ordinance, that is readable by the public at the main entrance to the property for all sites with building or grading permits that involve disturbing one acre or larger.

Yuma County Ordinance No. **05-01**, effective in 2005, requires any person getting a building or grading permit of one acre or greater to install and maintain a Project Information Sign in accordance with requirements contained in the ordinance. Yuma County maintains a computer log of all complaints and has had excellent success with compliance as soon as the contractor is alerted to the receipt of a complaint. Copies of these ordinances appear in **Appendix H** for information purposes.

One-on-one contact is made at the time of complaint response to ensure onsite implementation of dust control plans and appropriate dust suppression techniques.

In addition, MCAS posts construction sites of one acre or more on its installation with signage containing dust complaint information. In 2005, this type of signage was used at six construction sites.

Although ADEQ did not model the effectiveness of R18-2-604, local dust control plan requirements, and the newer project sign requirements as part of the maintenance demonstration, the PM_{10} emissions reductions associated with this control strategy are estimated at 1% effectiveness or <u>**22 TPY**</u> by ADEQ.

<u>Economic Feasibility</u>: It costs the City of Yuma approximately $5,000 per year for program management and implementation. The City of Somerton estimated similar costs to enforce the project sign ordinance. Yuma County staff estimates that 0.2–0.3 full-time employee is dedicated to the implementation of this control measure since the employee is part-time Yuma County’s costs are approximately $15,000 annually

to enforce this requirement in the unincorporated areas of Yuma County in the nonattainment area.

2. Paved Roads: Street Sweeping

a. Existing Control Measures

Section 6.3.7 and Table 6.3 above describe publicly owned street-sweepers and current sweeping practices in detail.

b. Continuing BACM Technological Feasibility for SIP

PM_{10}-efficient street sweepers are technically feasible for the Yuma area. As described in Section 6.3.7 above, four PM_{10}-efficient street sweepers and two standard street sweepers are used by the City of Yuma to control dust from paved roads. The City of Yuma has already purchased and is using PM_{10}-efficient sweepers, as compared to the Maricopa County commitment to purchase such sweepers in its Serious PM-10 Nonattainment Area SIP. These street sweepers were purchased for the continued maintenance of the City of Yuma streets as described in its Standard Operational Procedures included in **Appendix H** for information purposes. Somerton and Yuma County commit to the purchase of PM_{10}-efficient street sweepers upon replacement of their standard street sweepers, to assist in maintainance of the NAAQS. Approximately 292 miles of streets are swept in the City of Yuma, and approximately 510 miles of streets are swept in Yuma County's jurisdiction. Somerton operates its sweeper daily. ADEQ modeled these measures as part of the maintenance demonstration for Yuma (see Table 3-2 of the TSD). Even greater PM_{10} emissions reduction from paved roads will be achieved when the Somerton and Yuma County street sweepers in the Yuma area are replaced with PM_{10}-efficient street sweepers. Frequent street sweeping with PM_{10}-efficient street sweepers is BACM as determined for Maricopa County; South Coast, California, and Clark County, Nevada, in its Table 4-14 BACM Control Measures.

Economic Feasibility: The City of Yuma used its Highway User Revenue Fund to purchase its street sweepers, including one street sweeper on October 10, 2002, and a second street sweeper on October 16, 2002. The City paid \$156,887 and \$157,049, respectively, for these two street sweepers purchased from Norwood Equipment in Phoenix, Arizona. A sixth PM_{10} efficient street sweeper costing \$167,000 has been partially funded by a \$25,000 grant from ADEQ's Division of Water Quality in 2005. The City of Somerton purchased a standard street sweeper in March 2000 for \$135,733. Its maintenance costs have totaled \$3,698 2003-2006 plus \$12,709 for parts. Labor costs are \$36,157 annually for a full-time operator.

This measure should be approved into the SIP.

3. On-Road Vehicles: Covered Trucks

Yuma stakeholders selected increased enforcement of covered haul truck requirements as a NEAP commitment. A.R.S. §§ **28-1098**, **28-1873**, and **28-7056** address such transport. A.A.C. **R18-2-606** expressly prohibits transport of materials that result in significant amounts of airborne dust. City of Yuma Ordinance No. **2638** requires haul trucks to be covered. The statutes, rule and ordinance are in **Appendix H** for information purposes. After the measure was included in the submitted NEAP, the majority of Yuma law enforcement stakeholders expressed the view that they have authority to ticket trucks for safety violations but not for air pollution control violations. Municipal attorneys also had reservations about the extent of local authority under Arizona statutes and rules. Local officials will pursue any additional legal authority needed during the upcoming legislative session.

In view of perceived problems with the enforceability of this control measure, ADEQ did not include this measure in the modeled maintenance demonstration for Yuma. This measure would become a selected abatement measure for purposes of maintenance of the NAAQS only if the perceived enforcement authority issue can be resolved during the maintenance period.

Economic Feasibility: Should this measure proceed, costs would be absorbed in ongoing law enforcement activities in the planning area.

4. Yuma Agricultural Best Management Practices (AgBMP) Rule

a. BACM Technological Feasibility for NEAP and Maintenance Plan

As demonstrated in the Yuma NEAP, a detailed analysis of the PM_{10} concentrations during the wind event of August 18, 2002, revealed that agricultural fields contributed 17.7 percent of the concentrations on that day. ADEQ met with stakeholders of the agricultural community in Yuma County beginning in June 2002 to assess the impacts of particulate matter emissions from agricultural practices and potential emissions reductions from implementation of AgBMPs to develop an AgBMP program for Yuma. An AgBMP General Permit Rule and accompanying definitions had been adopted effective May 12, 2000, for the Maricopa County PM_{10} nonattainment area in Arizona Administrative Code R18-2-610 and 611. Pursuant to these rules, three agricultural emission source categories are controlled: (1) tillage and harvest (2) non-cropland and (3) cropland.

In 2004, in *Vigil v. Leavitt*, the U.S. Court of Appeals for the Ninth Circuit[20] upheld Arizona's BACM analysis for Agricultural Best Management Practices. Portions of the opinion are repeated below.

"Petitioners' argument that Arizona's general permit rule for agricultural PM_{10} emissions does not constitute BACM would be compelling if the Act required a state

[20] Opinion No. 02-72424 Filed May 10, 2004.

to reduce its emissions to the maximum extent possible, regardless of cost. EPA, however, has concluded that 'best available control measures' means the maximum degree of emissions reduction of PM10 and PM10 precursors from a source considering cost ….*Addendum*, 59 Fed. Reg. at 42010. Petitioners do not challenge this longstanding interpretation of the Act, and we cannot say that the interpretation is impermissible. *See Alaska Dep't of Envtl. Conservation*, 124 S. Ct. at 1001; *cf.* 42 U.S.C. § 7479(3) (similarly defining the term 'best available control technology' for purposes of the Prevention of Significant Deterioration program).

In its state implementation plan, Arizona explained why it listed 34 BMPs in three categories, yet required farmers to implement only three BMPs (one BMP in each category). Arizona reported that an effective agricultural PM-10 control strategy is 'highly dependent on specific local factors,' such as 'regional climate, wind strength and direction, soil types, [g]rowing season, crop types, cropping systems, moisture conditions, water availability, and relation to urban centers.' Air Quality Div., Ariz. Dep't of Envtl. Quality, Maricopa County PM_{10} Serious Area State Implementation Plan Revision: Agricultural Best Management Practices, Enclosure 3 at17-18 (June 13, 2001) (BMP Plan). Thus, 'each PM_{10} agricultural strategy must be based on local circumstances and a single BMP will not work equally for all growers.' *Id*. at 17. Arizona's plan stated that farmers were '*encouraged* to implement more than one BMP,' but 'it is not reasonable to *require* more than one BMP because in some instances one may be enough for a particular farm.' *Id*. at 18 (emphasis added). The committee 'could not determine that requiring more than one BMP would be reasonable given the cost and emission reduction uncertainties.' *Id*. at 18.

Common and accepted practice for the control of dust.... Allowing sources the discretion to choose from a range of specified options is particularly important for the agricultural sector because of the variable nature of farming. As a technical matter, neither we nor the State is in a position to dictate what precise control method is appropriate for a given farm activity at a given time in a given locale.... Moreover, the economic circumstances of farmers vary considerably. As a result, it is imperative that flexibility be built into any PM-10 control measure for the agricultural source category.

EPA concluded that the 'general permit rule represents a comprehensive, sensible approach' and satisfied BACM with respect to both the 24-hour and the annual standards. TSD at 240.

In developing the BMPs for the general permit rule, the Arizona committee considered agricultural PM-10 controls adopted by the South Coast region of California. BMP Plan at 15, 18. It noted, however, that the South Coast was the only other area in the United States to require implementation of BMPs to reduce agricultural PM-10 and that information concerning the effectiveness and cost of these BMPs was therefore limited. *Id*. at 18. EPA accepted Arizona's conclusions that agricultural production differs from farm to farm and that it was not possible to compare directly Arizona agriculture and California agriculture. EPA also acknowledged that the BMP committee had very limited information regarding the technological feasibility, costs, and energy and environmental impacts of the potential BMPs. Indeed, EPA found that Arizona could not evaluate the South Coast's practices because "the South Coast did not attempt to estimate the reductions and cost from each conservation practice."

EPA not only examined Arizona's final rule and rationale, it looked closely at the process by which Arizona arrived at its BMP Plan. Arizona assembled representatives from agriculture, state and federal agencies, and the University of Arizona – "a multi-year endeavor involving an array of agricultural experts familiar with Maricopa County agriculture." 67 Fed. Reg. at 48,730. The BMP Committee held public hearings and received public comments. It thoroughly reviewed the South Coast rules and found that certain aspects of them were not adapted to Arizona's conditions.

Arizona has offered a reasoned explanation for the choices it made, and EPA was within the bounds of its judgment and expertise to approve it."

Yuma stakeholders evaluated differences in the mix of crops in Yuma compared to Maricopa. Whereas Maricopa has high production of cotton and hay, Yuma harvests a substantially higher yield of vegetables and is known as the nation's "winter salad bowl." Yuma stakeholders considered the emissions impacts of each of the AgBMPs listed in R18-2-611 for implementation in the Yuma air quality planning area based on control efficiency and feasibility for Yuma crops and soil types.

In addition to the AgBMPs adopted for the Maricopa PM_{10} planning area, Yuma stakeholders considered AgBMPs quantified and adopted by the San Joaquin Valley Air Pollution Control District in California. After further evaluation, Yuma stakeholders chose to add to the Maricopa tillage and harvest practices the following BMPs: bed row spacing; conservation irrigation; conservation tillage; night farming; precision farming; and transgenic crops. Yuma stakeholders chose not to include reduced tillage system. They also added precision farming to the list of cropland measures. The selected AgBMPs for Yuma agriculture support principles that slow or control soil movement, conserve farm resources and prevent degradation of air quality. The Yuma PM_{10} AgBMP rule was adopted effective July 18, 2005, as **R18-2-613** and is being submitted separately. A copy of this rule is in **Appendix C** of the 2006 Maintenance Plan for information purposes. Yuma area farmers are required to implement at least one AgBMP in each of the three categories. The fifteen practices available with respect to tillage include combining tractor operations, limiting activity in high winds, and the use of multi-year crops. The ten AgBMPs for noncropland include restricting access to roads, reducing speed, and reducing wind erosion from roads. With respect to cropland, the fifteen available AgBMPs include the use of multi-year crops, residue management, timing of tillage, and planting crops based on soil moisture.

The adopted best management practices for Yuma agriculture support principles that slow or control soil movement, conserve farm resources and prevent degradation of the air quality. In agreement with requirements found in the Maricopa County PM_{10} General Permit, farmers who conduct agricultural activities in the Yuma County PM_{10} nonattainment area are required to implement at least one BMP for each of the three agricultural emission source categories. Yuma regulation goes further than the requirements in the Maricopa County PM_{10} General Permit by requiring that BMP records for Yuma provide the date each BMP was implemented to demonstrate compliance with the regulation, therefore necessitating the record to be updated when practices or crops are changed.

The AgBMPs were selected as BACM measures pursuant to EPA's Natural Events Policy and ADEQ's Policy 0159.00 Natural and Exceptional Events Policy to abate or minimize appropriate contributing controllable sources of PM_{10} during a future natural event. For that reason, they are not available for use as Maintenance Plan contingency measures. Nevertheless, because the AgBMPs were not modeled as measures required for the maintenance of the PM_{10} NAAQS through 2016, they should be viewed as providing additional confidence that Yuma will maintain the PM_{10} standard for many years to come. In the past decade, Yuma experienced only a single exceedance of the PM_{10} NAAQS, on August 18, 2002. That exceedance was caused by a natural event that was flagged by ADEQ, with concurrence by EPA. Estimated emission reductions from the Yuma AgBMPs are based on implementation on 60,192 non-citrus acres. A detailed explanation of the derivation of the emissions reduction estimate appears in Appendix C of the Yuma Maintenance Plan Technical Support Document. ADEQ has estimated that PM_{10} emission reductions of 2,062 TPY, or 6 Tons per Day, result from the Yuma AgBMP rule.

Economic Feasibility: In terms of compliance costs, ADEQ expects the Yuma County AgBMP program to have a minimal to moderate economic impact on commercial farmers. This is because farmers must implement a minimum of one best management practice from each of three categories: tillage and harvest, noncropland, and cropland. Equipment modifications, track-out controls, and constructing wind barriers, representing examples of AgBMPs from each category, could result in increased costs to commercial farmers. Another compliance cost associated with the AgBMPs is recordkeeping. Commercial farmers must demonstrate compliance with the rule by documenting which AgBMP is being implemented for tillage, harvest, cropland, and noncropland.

Because many of the AgBMPs listed in the rule already are being used by farmers, costs associated with implementing those techniques would represent sunk costs; hence, they would not be considered incremental compliance costs. Nonetheless, information provided by the Yuma Farm Bureau suggests that potential compliance costs could be as much as \$5.00 to \$10.00 per acre; depending on which AgBMPs are implemented, compliance costs might be either recurring or one-time costs. This estimate includes recordkeeping.

Estimated emission reductions from the Yuma AgBMPs are based on implementation on 60,192 non-citrus acres. The estimated cost would be, at most, \$300,960 to

$601,920. According to the Yuma Farm Bureau, commercial farmers already are implementing many of the AgBMPs, and as such, compliance costs resulting solely from these AgBMPs would be lower. Additionally, farmers can choose AgBMPs that would be the most economically feasible, which would tend to significantly reduce compliance costs.

For ADEQ, the impact due to the review of records submitted by commercial farmers is expected to be very minimal. The current FTEs are expected to handle the increase in the workload. Agricultural commodity groups may be impacted minimally as they educate and provide technical assistance to commercial farmers. ADEQ does not expect the Yuma County AgBMP program to significantly impact business revenues, payroll expenditures, or employment. ADEQ does not anticipate an impact upon state revenues.

This measure should be approved into the SIP.

5. Unpaved Roads

Permanent emission reductions have been achieved from the paving measures described in 6.3.3 above. Nearly 50% of publicly owned unpaved roads outside of the canal districts have been paved. Paving will continue to be technologically feasible throughout the nonattainment area. The existing watering and chemical dust suppression programs will continue to be operated by the municipalities and YCWUA as technologically feasible programs. Yuma County requires developers to pave all new private roads upon rezoning, although it is not possible to predict the paving rate precisely. Annual emission reductions will also continue to be achieved by the YCWUA through annual restocking of weed-eating fish, barricades, watering, and enforcement against trespass. Surface treatment, traffic reduction and speed controls are BACM measures employed in Maricopa County and in Clark County, Nevada, Table 4-14. ADEQ has modeled unpaved roads control strategies as part of the maintenance demonstration for Yuma (see Table 3-2 of the TSD).

Economic Feasibility: Controls for dust through watering and chemical suppressants on unpaved roads are already being implemented by the agricultural growers, local irrigation districts, and the water users' association. They would not be considered incremental compliance costs and have been budgeted by the respective jurisdictions. Consequently, ADEQ and the stakeholders agree that these controls are economically feasible for the Yuma area. Paving is much more costly, and any paving by the municipalities would occur through a competitive process coordinated by the Yuma Metropolitan Planning Organization using available funding.

This measure should be approved into the SIP.

6. Off Highway Vehicles

Off highway vehicles (OHVs) are a very minor source of dust in the nonattainment area. Local residents can call the dust complaint numbers listed on the Yuma public information pamphlet for their respective jurisdictions when they suspect OHVs are trespassing on public or private lands. The prevention of trespass of OHVs on public and private lands is being achieved through complaint response. Heavily used off-road recreational facilities are available in Imperial Valley, California, immediately west of Yuma County and at the Ehrenburg Bowl Off-Highway Vehicle Recreation Area in La Paz County, Arizona. Both of these areas are outside of the Yuma air quality planning area boundaries.

Economic Feasibility: The cost to prevent OHVs from trespassing on public or private lands is mainly associated with the printing and distribution of the Yuma public information pamphlet. Given the nominal cost associated with the public information pamphlet, ADEQ and the stakeholders deemed that preventing OHVs from trespassing on public and private lands is economically feasible. PM_{10} emissions reduction associated with this control strategy was not modeled as part of the maintenance demonstration, although the topic is discussed in the TSD.

7. Arizona Administrative Code R18-2-702 General Provisions Stationary Source 20% Opacity Limit

Additional emissions reductions from permitted sources in the Yuma Nonattainment Area are expected as a result of revising Arizona Administrative Code R18-2-702 General Provisions to satisfy a deficiency identified by EPA September 23, 2002 at 67 FR 59546. The previous opacity limit of 40% did not meet RACM for Moderate PM_{10} nonattainment areas. R18-2-702 applies to certain categories of permitted sources not covered by a separate source category specific opacity limit found in other sections of ADEQ rules, and it is in **Appendix B**. ADEQ revised this rule effective February 3, 2004, to correct this deficiency and submitted it to EPA. EPA approved this SIP submittal effective September 23, 2004. ADEQ chose to avoid reopening every permit issued under its jurisdiction simultaneously, as that would have been administratively burdensome. Instead, ADEQ sent out letters to all permit holders informing them that they are required to comply with the 20% opacity rule beginning February 3, 2004, except for emissions units subject to specific opacity limits, such as a 15% opacity limit for boilers. All State sources are required to abide by the General Provisions 20% opacity requirement regardless of whether it is included in the most recently issued permit or not. ADEQ has been including such language in all the permits issued or renewed since the rule went into effect on February 3, 2004, and will continue to do so.

ADEQ did not model the PM_{10} emissions reduction associated with this control measure as part of the maintenance demonstration or as a contingency measure.

Economic Feasibility: The economic impact of R18-2-702 on ADEQ was minimal. Although the Permits Section of the Air Quality Division will eventually have to revise additional permits to incorporate the 20% opacity limit, ADEQ does not anticipate any need for additional employees or resources. Although each regulated facility is unique, compliance with the 20% opacity limit is technically feasible although facilities might have to buy new equipment or need to modify existing equipment, make adjustments or enhancements to operations and maintenance, and replace or modify processes and designs. ADEQ does not anticipate that the general public will experience any costs as a result of the rule, outside of a minor increase in costs for those goods and services that might be affected by the lower opacity limit. ADEQ has already estimated that only a few sources, and therefore any goods and services they offer, might be affected by the rule.

This measure should be approved into the SIP.

8. Other Stationary Source Control Measures

A current list of the stationary sources in the Yuma Nonattainment Area is contained in **Appendix B** of the 2006 Maintenance Plan. Actual direct emissions from these sources are well below applicability thresholds for New Source Review. Trackout from plant property onto paved roads may create PM_{10} emissions associated with permitted sources in the Yuma nonattainment area. This will be a focus area in future permit renewals.

Economic Feasibility: ADEQ routinely amends the permits of sources under its jurisdiction. Consequently, adding the General Provisions upon permit renewal for PM10 sources in the Yuma area would not amount to any incremental compliance costs for ADEQ. It could result in incremental compliance costs for the sources. ADEQ estimates these increased costs to be minimal. Consequently, ADEQ concluded that this control measure was economically feasible for the Yuma area.

9. Pilot Tests and Studies of New Emission Reduction Techniques for Windblown Dust

As part of the Yuma NEAP, ADEQ had the option of including commitments to conduct pilot tests of new emission reduction techniques. Although Yuma stakeholders did not identify pilot tests on new emission reduction techniques to test their feasibility and effectiveness, the U.S. military is conducting tests to develop new emission factors for dust-disturbing activities from Department of Defense training and testing activities. The Strategic Environmental Research and Development Program is developing emission factors for "Dust Generated by Unique Military Activities" according to CP-1399 and CP-1400 revised November 5, 2004. These documents are in **Appendix H** for information purposes. Project completion is anticipated in 2009. The Desert Research Institute is working with the U.S. Army Engineer Research and Development Center on this project.

Any information made available to ADEQ as a result of this study will be shared with Yuma stakeholders and will be used to further refine future planning efforts.

7.0 CONTINGENCY MEASURES AND CONTINUING COMMITMENTS

7.1 Contingency Measures

Section 175A of the CAA requires that a maintenance plan include contingency provisions, as necessary to promptly correct any violation of the NAAQS which may occur after redesignation of the area to attainment. ADEQ is required to implement all measures with respect to the control of PM_{10} in the Yuma area which were contained in the SIP for Yuma before redesignation of the Yuma area to attainment. These contingency measures are distinguished from contingency measures generally required for nonattainment areas under section 172(c)(9). To satisfy this requirement, ADEQ is not required to have fully adopted contingency measures that will take effect without further action by ADEQ in order for this maintenance plan to be approved by EPA. Nevertheless, the contingency measures are considered to be an enforceable part of the SIP. As an integral part of the plan, ADEQ should identify specific indicators, or triggers, which will be used to determine when the contingency measures need to be implemented.

The trigger mechanism for the maintenance plan contingency measures is reached when ambient concentrations reach pre-determined threshold levels. A contingency measure or a combination of contingency measures will be implemented if the ambient PM_{10} level in the Yuma PM_{10} Nonattainment Area exceeds 95% of the NAAQS. Consequently, these contingency measures would be activated if the 24-hour average NAAQS reaches 143 ug/m^3 or above or the annual NAAQS reaches 48 ug/m^3 or above.

As with the control measures in Chapter 6, ADEQ began working with the Yuma area stakeholders in 1991 to identify contingency measures that could be implemented in case of a future violation in the Yuma area after its redesignation to attainment. More contingency measures were identified by 1994. Contingency measures were further discussed with Yuma stakeholders during the NEAP development and implementation process. Contingency measures provide additional assurance that the PM_{10} NAAQS will be maintained through 2016 and beyond. The contingency measures for the Yuma area are contained in Table 7-1.

None of the emissions reductions in this chart have been counted towards the maintenance demonstration.

Table 7.1 -- Contingency Measures for the 2005 Yuma PM_{10} Maintenance Plan

CONTINGENCY MEASURE	Area of Applicability	Quantity	Estimated Reduction Tons/Year
Pave existing unpaved miles of road	Throughout Yuma air quality planning area	City of Yuma: 0.44 mile/year City of Somerton: 0.1 mile/year Yuma County: 1.0 mile/year	78.7 TPY for each paved mile that carries 500 vehicles/day
Chemically stabilize miles of unpaved roads		City of Yuma: 10 City of Somerton: 30 Yuma County: 60 miles/year, twice a year	2,555 TPY
Adopt 20% opacity standard for sources of fugitive dust	Throughout Yuma air quality planning area	12 miles of roads and 265 acres	149 TPY
TOTALS			**2,782.7 TPY**

SOURCE: ADEQ Air Quality Division Planning and Assessment Sections, 2006

These measures have not been modeled to demonstrate maintenance of the NAAQS. ADEQ is aware that EPA will review what constitutes a contingency plan on a case-by-case basis. ADEQ has every expectation that EPA Region IX will approve the contingency plan submitted to EPA as part of this maintenance plan.

7.2 Commitments

7.2.1 CAA Section 110 Continuing Commitments

Section 110(a)(2)(A) of the CAA requires that States provide for enforceable emissions limitations and other control measures, means, or techniques, as well as schedules for compliance with the PM_{10} NAAQS. Chapter 6.0 includes a list of control measures that enabled the Yuma area to reach and maintain attainment. ADEQ commits to enforce these measures to maintain the 24-hour average and annual NAAQS ending in 2016.

Section 110(a)(2)(B) of the CAA requires that States provide for establishment and operation of appropriate devices, methods, systems, and procedures necessary to monitor, compile, and analyze data on ambient air quality. Under ADEQ's air quality assessment program, ambient monitoring networks for air quality are established to sample pollution in a variety of representative settings, to assess the health and welfare impacts, and to assist in determining air pollution sources. These networks cover both urban and rural areas of the State. The monitoring sites are combined into networks, operated by a number of government agencies and regulated companies. Each network is comprised of one or more monitoring sites, whose data are compared to the NAAQS, as well as being statistically analyzed in a variety of ways. The agency or company operating a monitoring network also tracks data recovery, quality control, and quality assurance parameters for the instruments operated at their various sites. The agency or company often also measures meteorological variables at the monitoring site. Chapter 3.0 presents monitoring network information and data for the Yuma area.

Monitoring data collected as part of ADEQ's air quality assessment program are summarized into the appropriate quarterly or annual averages. The samplers are certified as Federal Reference or Equivalent Methods. Regular checks of the stability, reproducibility, precision, and accuracy of the samplers and laboratory procedures are conducted by either the agency or company network operators. The protocol for PM_{10} monitoring used by the State, local agencies, and companies is established by EPA in the following sections of the Code of Federal Regulations (CFR):

- 40 CFR Part 50, Appendix J, Reference Method for the Determination of Particulate Matter as PM_{10} in the atmosphere;

- 40 CFR Part 50, Appendix K, Interpretation of the National Ambient Air Quality Standards for particulate matter; and

- 40 CFR Part 58, Appendix A, Quality Assurance Requirements for SLAMS
    - Section 2, Quality System Requirements
    - Section 3.3 and 3.4.1, Data Quality Assessment Requirements
    - Section 4.2, Annual Reports
    - 40 CFR Part 58, Appendix D, Section 2.8, Particulate Matter Design Criteria for SLAMS
    - 40 CFR Part 58, Appendix E, Probe and Monitoring Path Siting Criteria for Ambient Air Quality Monitoring, Section 8, Particulate Matter.

ADEQ commits to continue to operate the monitors in the Yuma area according to the references and guidelines referenced above for the duration of this maintenance plan to demonstrate maintenance through 2016.

Section 110 (a)(2)(C), Section 110 (a)(2)(E), Section 110 (a)(2)(F), and Section 110 (a)(2)(L) of the CAA require States to have permitting, compliance, and source reporting authority. Arizona Revised Statutes (ARS) § 49-402 establishes ADEQ's permitting and enforcement authority. As authorized under ARS § 49-402, ADEQ retains adequate funding and employs adequate personnel to administer the air quality program. Appendix A includes the organizational chart for ADEQ's Air Quality Division.

Under ADEQ's air permits program, stationary sources (e.g., businesses, utilities, governmental agencies, and universities) that emit significant amounts of regulated air pollutants are required to obtain a permit before constructing, modifying, replacing, or operating any equipment or process which may cause air pollution. Existing sources are also required to obtain a revision or modification to their permits before transferring ownership, relocating, or otherwise significantly changing the method of their operation. Additionally, ADEQ is responsible for assessing fees based on the actual emissions submitted in the emissions inventory for all sources under ADEQ jurisdiction pursuant to Arizona Administrative Code (AAC) R18-2-326.

State regulations (AAC R18-2-327) require that any source subject to a permit must complete and submit to the Director of ADEQ an annual emissions inventory questionnaire. A current air pollutant emissions inventory of both permitted and non-permitted sources within the State is necessary to properly evaluate air quality program effectiveness, as well as assessing emission fees. ADEQ is responsible for the preparation and submittal of an emissions inventory report to EPA for sources and emission points prescribed in 40 CFR 51.322 and for sources that require a permit under ARS 49-426 for criteria pollutants. This inventory will encompass those sources under State jurisdiction emitting 1 ton/year or more of any individual regulated air pollutant, or 2.5 tons/year or more of any combination of regulated air pollutants. Regulated air pollutant is defined in AAC R18-2-101.98.

Under ADEQ's air quality compliance program, major sources are inspected annually, while minor sources are inspected every two to three years. However, minor sources may be the subject of various initiatives during the year. If a particular sector (e.g., dry cleaners, portable sources) has evidenced problems in the prior year (e.g., failure to submit move notices by portable sources), ADEQ's Air Compliance Section implements initiatives to address the problem (e.g., seminars and workshops for the regulated community explaining the general permit requirements; individual inspections of all portable sources within a geographical area, mailings, etc.). In addition, compliance initiatives are developed to address upcoming or future requirements (e.g., new general permits) and include such actions as training for inspectors; development of checklists and other inspection tools for inspectors; public education workshops; targeted inspections; mailings, etc. ADEQ's Air Compliance Section also has an internal performance measure to respond to all complaints as soon as possible, but no later than within five working days.

Section 110(a)(2)(G) of the CAA requires that States provide for authority to establish emergency powers and authority and contingency measures to prevent imminent endangerment. AAC R18-2-220 prescribes the procedures the Director of ADEQ shall implement in order to prevent the occurrence of ambient air pollution concentrations which would cause significant harm to the public health. As authorized by ARS § 49-426.07, ADEQ may seek injunctive relief upon receipt of evidence that a source or combination of sources is presenting an imminent and substantial endangerment to public health or the environment.

ADEQ commits to continue to follow and enforce the requirements of Section 110 of the CAA for the duration of the maintenance plan.

7.2.2 CAA Section 172 Continuing Commitments

Section 172(c)(1) of the CAA requires that nonattainment plan provisions provide for the implementation of all reasonably available control measures (RACM) as expeditiously as practicable and demonstrate attainment of the national primary ambient air quality standards. This requirement has been fulfilled. Chapter 6.0 includes a description of RACMs that have been implemented in the Yuma area to control PM_{10} emissions and bring the area into attainment for the PM_{10} NAAQS.

Section 172(c)(3) and Section 172(c)(4) of the CAA require a current inventory of actual emissions from all sources of the relevant pollutant or pollutants and projected emission inventories. This requirement has been fulfilled. The 1999 base year emissions and the 2016 projected emissions for the Yuma Nonattainment Area are contained in Chapter 4.0.

Section 172(c)(5) of the CAA require permits for the construction and operation of new or modified major stationary sources. All new sources and modifications to existing sources in Arizona are subject to State requirements for preconstruction review and permitting pursuant to AAC, Title 18, Chapter 2, Articles 1, 3, 4, and 5. All new major sources and modifications to existing major sources in Arizona are subject to the New Source Review (NSR) provisions of these rules, including Nonattainment Area Analysis (NAA) and Prevention of Significant Deterioration (PSD). The State NSR program was conditionally approved by EPA in 1982, but since then ADEQ's rules have been updated.

7.2.3 CAA Section 176 Continuing Commitments

Section 176(c)(1) of the CAA contains general conformity requirements that currently apply to federal agency-related activities, except transportation projects,[21] in the Yuma PM_{10} Nonattainment Area (see Chapter 2.0). ADEQ commits to work with the federal agencies, federal grant recipients, and federal licensees and permittees in the Yuma area to ensure that the CAA Sections 118 and 176 and Title 40 C.F.R. § 93.150 - 160 will be met for applicable federal projects.

[21]The Clean Air Act requires that transportation plans, programs, and projects in nonattainment or maintenance areas that are funded or approved by the Federal Highway Administration or Federal Transit Authority be in conformity with the state implementation plan through a separate process described in the transportation conformity regulation (Title 40 C.F.R., Parts 51 and 93, November 24, 1993, as amended in August and November 1995).

Section 176(c)(2) of the CAA contains transportation conformity requirements (see Chapter 2.0). ADEQ commits to working with the YMPO to ensure that the transportation plans and programs within the Yuma Nonattainment Area conform to the maintenance plan.

7.2.4 CAA Section 189 Continuing Commitments

Section 189 requires the state implementation plan for the Yuma area to include a permit program meeting the requirements of Section 173. Permits are required for the construction and operation of new and modified major stationary sources of PM_{10}. ADEQ commits to continue to fulfill the requirements of the CAA Section 189. This commitment will ensure that all new sources and modifications to existing sources in Arizona are subject to State requirements for preconstruction review and permitting pursuant to AAC, Title 18, Chapter 2, Articles 1, 3, 4, and 5. All new major sources and modifications to existing major sources in Arizona are subject to the New Source Review provisions of these rules, including Nonattainment Area Analysis and Prevention of Significant Deterioration.

8.0 PUBLIC PROCESS AND RESPONSIVENESS SUMMARY

ADEQ began working with the stakeholders in July, 2001, in developing the maintenance plan and redesignation request for Yuma and continued to do so until an exceedance of the 24-hour NAAQS occurred once again in Yuma on August 18, 2002. ADEQ identified the various stakeholders in the Yuma area; these stakeholders include the local jurisdictions, the metropolitan planning organization, the agricultural community, federal agencies, two Native American tribes, the water users' association and irrigation districts, and the Arizona Department of Transportation. As a result of the August 18, 2002, exceedance, the maintenance plan was postponed until a natural events action plan (NEAP) was completed for the Yuma area. ADEQ resumed work on the maintenance plan in the fall of 2005. By the time the maintenance plan and the technical support document (TSD) were placed in the depositories for public review, ADEQ had held over ten stakeholder meetings with the stakeholders in the Yuma area.

8.1 Public Comments in Response to April 4, 2006, Public Hearing

The public hearing on the Yuma PM_{10} Maintenance Plan and Technical Support Document was held at 4:00 p.m. on Tuesday, April 4, 2006, in the City of Yuma's Department of Public Works Training Room, 155 West 14th Street, Yuma, Arizona. The public comment period closed at 5:00 p.m. on Tuesday, April 4, 2006. Summaries of oral and written comments on the Yuma PM_{10} Maintenance Plan and Technical Support Document follow. Copies of the oral and written comments, along with the documentation of the public hearing, are found in Appendix K. The following summary has attempted to identify and combine similar comments for ease of response. Please note that all page number references are to the maintenance plan and on the TSD as the documents appeared on the ADEQ website at: http://www.azdeq.gov/environ/air/plan/notmeet.html#yuma.

Control Measures

1. **Issue:** With respect to page 4-15 of the Yuma Maintenance Plan, commenter recommended that this section contain a discussion on the "Yuma Metropolitan Planning Organization (YMPO) 2005 Air Quality Conformity Analysis AgBMPs" and their contribution to a greater annual decrease in PM_{10} emissions.

   Response: A detailed explanation of the emissions reductions estimate associated with the Yuma AgBMPs appears in Appendix C of the Yuma Maintenance Plan Technical Support Document.

2. **Issue:** With respect to Section 6.1 Maintenance Demonstration Control Measures of page 6-1 of the Yuma Maintenance Plan, commenter noted that several significant control measures demonstrated by both the City of Yuma and Somerton are listed. Commenter requested that ADEQ also includes a description of the significant measures initiated by Yuma County.

Response: Chapter 6.0 of the Yuma Maintenance Plan has been rewritten. It now includes a description of the significant measures initiated by Yuma County. For example, Yuma County's paving project is described at the bottom of page 6-2.

3. **Issue:** With respect to page 7-1 of the Yuma Maintenance Plan, commenter noted the sentence "A contingency measure or a combination of contingency measures will be implemented if the ambient PM_{10} level in the Yuma PM_{10} Nonattainment Area exceeds 95% of the NAAQS." Commenter stated that ADEQ should provide further guidance regarding notification requirements and implementation of contingency measures if the NAAQS is exceeded. He stated that allowing PM_{10} concentration levels to reach 95% of the NAAQS before implementation of contingency measures might not allow local communities the ability to implement measures to remain below the NAAQS.

   Response: Looking at the trends of 24-hour and annual NAAQS for the Yuma area (see Table 3-3 on page 3-7 of the Draft Yuma Maintenance Plan), a slow, but steady, increase towards the 24-hour and annual standard is discernible. Based on this trend, PM_{10} concentrations will reach 95% of the NAAQS probably a year (or at least several months) before they actually reach the NAAQS. This should allow local communities enough time to implement contingency measures to remain below the NAAQS, since Yuma has more than a decade of clean air.

   ADEQ will work closely with the Yuma jurisdictions to notify them of an impending violation and to assist in the implementation of contingency measures to prevent a future violation of the NAAQS in the Yuma area.

4. **Issue:** Commenter asked if ADEQ has demonstrated that air quality improvements in the Yuma area are the result of actual enforceable emissions reductions for the years 2005 up to 2016.

   Response: The permanent emissions reductions in the Yuma area are described in Chapter 6.0.

5. **Issue:** Commenter stated that ADEQ did not use receptor analysis, chemical mass balance (CMB) in this case, for Yuma. Commenter asked how did ADEQ determine the amount and kind of emissions reductions for which controls were required.

   Response: Because the ambient record was already meeting the standards, there was no need to determine the degree of necessary emission reductions. Instead, the emission reductions from all of the documented control projects were calculated (Chapter 3, Technical Support Document).

6. **Issue:** Commenter stated that it appears that control measures were implemented in 1994. He stated that the State has not made an adequate demonstration that the improvement in air quality between 1994 and 2000 was not due to favorable meteorology during this time.

Response: Table 3-3 of the July version of the Technical Support Document has the emission reductions for the period 1991 – 1999, which average about 1,000 tons per year. These reductions offset the growth of the community and have kept the air quality within standards. As far as favorable weather is concerned, six of the 14 years had below average rainfall, against eight which were above average. The frequency and severity of high winds and unusually strong surface inversions would be expected to show year to year variation. Unlike rainfall, or the lack thereof, there is no known trending mechanism in these phenomena that would account for a sustained favorable (or unfavorable) period.

Corrections/Editorial/Typographical Comments

1. **Issue:** Commenters suggested that the term "U.S. Army Garrison" should read "U.S. Army Yuma Proving Grounds" on pages 1-8 and 2-3 of the Yuma Maintenance Plan.

   Response: ADEQ concurs, and the change has been made in the submitted edition.

2. **Issue:** Commenter asked that "This amounts to a proposed increase of 23.9.7%" on page 1-5 of the Yuma Maintenance Plan be corrected.

   Response: ADEQ concurs, and the change has been made in the submitted edition.

3. **Issue:** With respect to page 2-6 of the Yuma Maintenance Plan, commenter suggested adding the text "except for an unusual wind event in 2002" to the sentence in Section 2.7.1 that reads "Chapter 3 reveals that there has not been a violation of the PM_{10} NAAQS in Yuma since 1991."

   Response: ADEQ concurs, and the change has been made in the submitted edition.

4. **Issue:** With respect to page 2-12 of the Yuma Maintenance Plan, commenter suggested re-writing the statement "…such as the one that has precipitated this NEAP" to "…such as the one that precipitated the Yuma NEAP."

   Response: ADEQ concurs, and the change has been in Section 2.11.1.

5. **Issue:** With respect to page 3-1 of the Yuma Maintenance Plan, commenter requested that ADEQ change "PM10" to "PM_{10}".

   Response: ADEQ concurs, and the change has been made in the submitted edition.

6. **Issue:** With respect to Table 4-2 on page 4-4 of the Yuma Maintenance Plan, commenter requested ADEQ recheck all total calculations. He stated that the emissions calculated for Fall (41,430) should be 41,429. The emissions calculated for Winter (56,453) should be 56,454. The total (130,331) should read 130,330. The total annual for the Alluvial Plan and Channels (2517) should read 2516.

Response: The data in this table have been revised and the correct sums are reflected in the total columns.

7. **Issue:** With respect to page 6-12 of the Yuma Maintenance Plan, commenter noted the sentence "Yuma County developed a Public Service Announcement (PSA)…". Commenter asked ADEQ to include a reference regarding the air quality brochure developed by Yuma County and Yuma County's Web-site devoted to educating the public regarding air quality issues. Commenter instructed ADEQ to go to http://www.co.yuma.az.us/dds/EP.htm for additional information on Yuma County's environmental issues.

   Response: ADEQ concurs, and the change has been made in the submitted edition and a copy of the brochure has been added to Appendix D.

8. **Issue:** With respect to Appendix E, commenter noted the phrase "Title: Development Services Coordinator". Commenter requested that ADEQ change the title for Luis Miranda to "Environmental Programs Manager" and also change the phone number listed for him to (928) 817-5000. In addition, he stated that the e-mail address needs to read as follows: Luis.Miranda@co.yuma.az.us. He informed ADEQ that the Yuma County Department of Development Services Web-site has been changed to http://www.co.yuma.az.us/dds/EP.htm.

   Response: ADEQ concurs, and the changes have been made in the submitted edition.

9. **Issue:** With respect to Table 4-16 on page 4-19 of the Yuma Maintenance Plan, commenter recommended that the emissions data summary should be converted from kg/day to tons/day to ensure that the information is consistent with local conformity documents, particularly the YMPO Air Quality Analysis.

   Response: ADEQ concurs, and the change has been made in the submitted edition.

10. **Issue:** With respect to Table 5-3 on page 5-4 of the Yuma Maintenance Plan, commenter stated that the method of describing percent change in the table is contrary to typical percent change descriptions and could lead to confusion in interpreting the data.

    Response: ADEQ concurs, and the changes have been made in the submitted edition.

11. **Issue:** With respect to Table 5-3 on page 5-4 of the Yuma Maintenance Plan and Table 2-3 on page 2-4 and Table 3-4 on page 3-10 of the TSD, commenter stated that it does not seem reasonable that agricultural tilling amounts would remain unchanged when the number of acres of agricultural land in the study area is decreasing due to urbanization. Commenter stated that as the region continues to grow and agricultural lands are urbanized, this number would decrease.

Response: ADEQ agrees that agricultural acreage within the nonattainment area will decrease in future years. Nonetheless, the assumption that it will be constant introduces a conservative margin in the future year inventory, since agricultural emissions are higher than emissions from activities that replace them. Air quality modeling based on a future year inventory with an overestimate of agricultural emissions gives concentration estimates on the high side, and yet they are still well within the standards.

12. **Issue:** With respect to page 4-5 of the Yuma Maintenance Plan, commenter quoted the statement “Daily VMT estimates were not available for 2016 for this analysis.” He asked if this statement is correct in view of the fact that Table 4-5 shows daily VMT estimates for 2016. He asked ADEQ to specify the difference.

Response: Lima & Associates projected 2013 and 2025 daily VMT on paved roads. Daily VMT estimates were not available for 2016 for the Lima & Associates analysis. Consequently, ADEQ calculated the average annual growth rate for each road type from 2013 to 2025 and this information was presented in Table 4-5.

13. **Issue:** With respect to page 4-11 of the Yuma Maintenance Plan, commenter asked that Table IV-21 in “…Yuma International Airport, shown in Table IV-21.” be changed to read Table 4-9.

Response: ADEQ concurs, and the change has been made in the submitted edition.

14. **Issue:** With respect to page 5-9 of the Yuma Maintenance Plan, commenter asked ADEQ to consider rewriting the last sentence of the last paragraph on that page from “The Yuma concentrations on those two days…on July 17.” to “…on July 17 (see Table 5-9).” He stated that adding the reference to Table 5-9 may add clarity since Table 5-7 also appears on page 5-9 and may lead some readers to confusion regarding the source of the information.

Response: ADEQ concurs and the change has been made in the submitted edition.

15. **Issue:** With respect to page 5-11 of the Yuma Maintenance Plan, commenter stated that Section 5.5 contains a sentence that reads “Table 5-11 illustrates the results of modeling the hourly emissions…”. He stated that Table 5-11 references Hourly Average Wind Speeds and asked if the sentence in question should not read Table 5-10.

Response: This is no longer relevant. Chapter 5.0 has been rewritten and Table 5-11 now illustrates the modeling results for PM_{10} levels in 2016 at the Yuma Juvenile Center.

16. **Issue:** With respect to page 5-19 of the Yuma Maintenance Plan, commenter noted the sentence “Table 5-14 begins with the observation (“OBS”) of the 24-hour average…”. He also noted that Table 5-13 references Domain-Wide PM_{10}

Concentrations in Yuma. He asked if the sentence “Table 5-14 begins…” shouldn’t read “Table 5-13?”

Response: This is no longer relevant. Chapter 5.0 has been rewritten and Table 5-13 now contains the Yuma PM_{10} 24-hour concentrations for 2016 and Table 5-14 now contains the demonstration of attainment for the annual PM_{10} standard in Yuma in 2016.

17. **Issue:** With respect to page 5-22 of the Yuma Maintenance Plan, commenter noted the sentence “The top ten values from this figure are shown in Table 5-15 and reveal the following...”. He also noted that Table 5-14 references Yuma 24-Hour Average PM_{10} Concentrations. He asked if the sentence “The top ten…” shouldn’t read “Table 5-13.”

Response: This is no longer relevant. Chapter 5.0 has been rewritten. Table 5-15 now contains the Yuma PM_{10} annual average for the 1985-2004 timeframe. See the preceding response with respect to Tables 13 and 14.

18. **Issue:** With respect to page 5-23 of the Yuma Maintenance Plan, commenter noted the sentence “These data support scaled predicted domain maximum…given in Table 5-14.” He also noted that Table 5-13 references Domain-Wide PM_{10} Concentrations in Yuma and that Table 5-13 also specifies the Max and Normalized concentrations identified in this paragraph. He asked if “Table 5-14” shouldn’t read “Table 5-13.”

Response: This is no longer relevant. See the response in 16 with respect to Tables 13 and 14.

19. **Issue:** With respect to page 5-27 of the Yuma Maintenance Plan, commenter noted the sentence “The necessary calculations for this exercise are illustrated in Table 5-19.” He also noted that Table 5-18 provides calculations for the Demonstration of Attainment. He asked if “Table 5-19” shouldn’t read “Table 5-18?”

Response: This is no longer relevant. Chapter 5.0 has been rewritten and Tables 5-18 and 19 no longer exist.

Inventory

1. **Issue:** Commenter asked if the 1999 base year inventory and the 2016 inventory are worst case day emission inventories.

Response: No, they are days typical of the different seasons and they include two days with agricultural tillage.

2. **Issue:** Commenter stated that there appears to be incongruity between the sixteen days that were modeled (eight for 1999 and eight more for 2016) in Table 2-5 of the

Yuma Maintenance Plan Technical Support Document and the PM_{10} emissions inventory for 1999 and 2016.

Response: The resolution of the inventory was limited to seasonal differences, weekend/weekday differences, and the presence or absence of agricultural tillage and high wind emissions. With this limitation in mind, it is apparent that as long as these seasons, days of week, and presence or absence of emissions were associated properly between the inventory and modeling date, that no compromises were involved.

3. **Issue:** Commenter asked if ADEQ can give more specifics how it developed its land use data. Did ADEQ develop land use data for portions of Baja, Mexico, and Imperial County, California that are included in the modeling domain? Commenter asked what agencies ADEQ collaborated with to obtain land use data and activity levels for the jurisdictions outside of Arizona. Commenter stated that ADEQ should include these raw data in an appendix to allow for public review and comment.

Response: The data were obtained the same way as they were obtained for the Yuma area. Satellite images were analyzed, various categories were assigned to the different land uses of the images, and these land uses were electronically distributed and tabulated accurately.

4. **Issue:** Commenter stated that Mexican paved roads are typically dirtier than paved roads on the American side due to track-out, unpaved road shoulders, lack of landscaping or road shoulders, and debris and spillage on the roads. Commenter stated that these factors were obviously not considered by ADEQ. He stated that the use of VMT growth estimates for 2016 based on growth of Yuma County would seriously under-predict the contribution of emissions from Mexican fleets in the year 2016.

Response: ADEQ agrees that these emissions were underestimated for the stated reasons. However, the part of Baja California within the modeling domain is but a small portion of the total domain. Furthermore, these sources are on its western edge, about as far away from the monitor as possible and still be within the domain. Consequently, these emissions do not play an important role in Yuma air quality, either modeled or measured.

Modeling

1. **Issue:** Commenter asked why the large rectangular area was chosen for the emissions inventory and the air quality modeling, and why this area does not include all of the nonattainment area.

Response: The rectangular shape of the domain is necessary to conduct grid-based, urban scale air quality modeling. Its size, intended to encompass nearly all of the emissions that might affect the monitoring site in Yuma, is limited by the available funding for the emissions inventory.

2. **Issue:** Commenter asked if ADEQ can simulate PM_{10} concentrations in 2016 with any degree of accuracy.

Response: ADEQ acknowledges that emission inventories have many elements of uncertainty, including, but not limited, to the projections of growth and emission factors for a distant year. ADEQ uses the best information available in developing estimates of future emissions and concentrations.

<u>Monitoring Data</u>

1. **Issue:** One commenter expressed concern that the monitoring data in the Yuma area were collected from a single monitor, 25 miles or more away from the major polluting sources. Another commenter asked if the present monitor is in the ideal location to accurately identify the significant emissions of PM_{10} in Yuma based on the growth and development of the Yuma area since 1985?

Response: Figures 2-4 and 2-10 of the submitted Technical Support Document show that the monitor's location is within the highest emissions areas and close to the model-predicted maximum on a low wind day. The monitor is sited in accordance with the Code of Federal Regulations.

2. **Issue:** Commenter stated that most of the monitoring has been sporadic and has been on Sunday or Monday when there was little PM_{10} generating activity.

Response: PM_{10} monitoring is conducted on a one day in six schedule, which means 60 samples are collected every year. Each day of the week has equal representation.

3. **Issue:** Commenter stated that a couple of weeks after the Arizona Clean Fuels Yuma refinery received its permit, the Yuma area experienced an air alert. It was not a windy day when the alert was issued.

Response: This maintenance plan addresses PM_{10} emissions and not ozone precursors.

4. **Issue:** Commenter expressed concern over the frequent air inversions in the Yuma area and expressed a belief that over the last four years the chemical trails (from aircraft) have contributed to the Yuma area air inversions lasting longer and being more severe.

Response: Radiative surface inversions that occur nightly lead to elevated pollution levels, especially in the winter with its longer nights. Their frequency and severity is dictated by having clear skies (clouds weaken inversions), light winds (high winds disrupt the inversions), and dry air (high relative humidity weakens the inversion). Upper level contrails have no bearing on this phenomenon.

5. **Issue:** With respect to Figure 3-2 on page 3-8 in the Yuma Maintenance Plan, commenter stated that there should be more discussion as to the reason(s) why the Yuma study area PM_{10} annual readings from 1992 to the present dropped so drastically when compared to readings during 1989 – 1991. Commenter contended that this discussion should also be included on page 1-3 of the TSD.

   Response: Control measures were adopted and implemented beginning in 1991. For more details see Chapter 6.0.

6. **Issue:** Commenter asked ADEQ to describe the methodology by which EPA Region IX concurred with the Yuma Natural Events Action Plan (NEAP).

   Response: The NEAP is not a state implementation plan (SIP); therefore, it does not go through an approval process by EPA. We have incorporated the NEAP control measures into the maintenance plan.

7. **Issue:** With respect to page 3-1 of the Yuma Maintenance Plan, commenter asked ADEQ to specify how often the monitor is calibrated and describe the procedures for calibration.

   Response: The PM_{10} monitors in Yuma are given flow, temperature, and pressure checks every 45 days, calibrations are performed every 180 days, and their flow is audited independently of the operators twice a year. The flow checks, calibrations, and audits all concern the flow through the instrument, which is accurately measured with a reference flow device that is certified annually. This is done in accordance with the Code of Federal Regulations.

8. **Issue:** With respect to Table 3-1 on page 3-2 of the Yuma Maintenance Plan, commenter requested that ADEQ specify the type of monitor device at 2440 W. 28th Street in Yuma.

   Response: Yuma has two, collocated PM_{10} instruments; they are both Partisol 2000s. The Partisol 2000 is the first EPA Federal Reference Method sampler to include an embedded microprocessor with internal data storage, active volumetric flow control, simple filter exchange, and quiet operation. The sampler is operated as a single-filter system at a flow rate of 16.7 l/min and houses 47 mm diameter filters in cassettes. This instrument is fitted with a 10 micron aerodynamic inlet for PM_{10} sampling.

9. **Issue:** Commenter believed that readings from the San Luis, Arizona, monitoring site should provide insight as to other background PM_{10} emissions generated by San Luis Rio Colorado, Sonora, Mexico and Mexico Highway 2.

   Response: ADEQ concurs that emissions from Highway 2 contribute to PM_{10} concentrations in Yuma. Emissions from this and other sources outside the modeling domain were treated as part of the background concentrations, which in the modeling were added to the model predictions to arrive at a total predicted concentration.

10. **Issue:** Commenter asked if particulate matter can be toxic. He asked if the particulate matter in the Yuma area is toxic.

Response: Particulate matter has many components that are toxic: lead, cadmium, arsenic, nickel, and manganese, commonly found in ambient particulate matter, all have long-term health risk guideline concentrations. Many other metals have one-hour or 24-hour guidelines. Elemental carbon from fuel, especially diesel combustion, has adverse health effects. Other fuel combustion byproducts that can be grouped as organic carbon also reside in the particulate phase and are carcinogenic. Most of the mass of particulates in Arizona and Yuma is of geologic origin. A study underway now will characterize Yuma and San Luis (Rio Colorado) particulates, including their toxic components.

11. **Issue:** Commenter asked what is the maximum distance that PM_{10} sources can be from the monitor at the Yuma County Courthouse and still be detected by the monitor.

Response: If the source is of moderate size and is at or near ground level and winds are moderate, sources within a quarter mile would contribute significantly to the measured PM concentrations. From one to three quarters mile the contribution would still be "measurable," if the emitted particulate could be tagged. Beyond that, the influence diminishes. When considering a large number of sources at much greater distances, which together can be considered as a transportable background concentration, tens to hundreds of miles can separate them from the monitor but they still influence it.

12. **Issue:** Commenter asked how much of the 170 ug/m^3 recorded on August 18, 2002, was due to sources in the immediate Yuma vicinity.

Response: Air quality modeling showed that 40% of the concentration was from human-caused emissions in the Yuma area. That leaves 60% for windblown dust. Without monitors along the storm's south-southeast to north-northwest path, it is impossible to separate the transported dust from the locally generated dust. If half of the windblown dust was transported, that means 50% was locally generated.

13. **Issue:** Commenter asked if it is true for Yuma that hourly concentrations of particulates tend to peak during the hours of the worst dispersion, which is from sunset to mid-morning?

Response: These patterns are the same in Yuma as the rest of southern Arizona. For example, in quarterly averages of PM in Phoenix: the first is 17% higher than the annual average; the second, 22% lower; the third, 31% lower; and the fourth quarter, 33% higher. The hourly PM variation in Yuma is the same as shown by Figure 2-7 in the Technical Support Document.

14. **Issue:** Commenter asked what would account for PM_{10} concentrations averaged for 24 hours in southwest Arizona being lower than 5 ug/m^3.

Response: In three years of sampling at Organ Pipe National Monument, of 163 PM_{10} samples, nine percent were below 5 ug/m^3. This range of ambient PM_{10} can occur through the absence of any nearby emission sources in a remote area, combined with rain. Annual average PM_{10} at Organ Pipe is 10.0 ug/m^3.

15. **Issue:** Commenter asked why ADEQ does not take daily readings for PM_{10} in Yuma.

Response: The one-in-six-day sampling schedule provides enough samples to adequately assess the annual average and high-24 hour averages throughout the year, at one sixth of the cost of daily sampling. This sampling schedule meets the requirements in the Code of Federal Regulations. Continuous instruments, such as the one now operating in Yuma, as part of a research study, are usually employed for daily sampling.

16. **Issue:** Commenter asked if the monitor has the capability to determine from which sources the PM_{10} emissions originated on any particulate matter monitoring day.

Response: With chemical analyses of the particulate, some limited source attribution can be accomplished through numerical models that either link the chemical composition of the emissions with that on the filter, or which statistically infer source composition directly from the chemical composition of the particulates. Neither of these methods is capable of distinguishing one type of geological source from another, and it is the myriad of geological or "crustal" sources that matter most in Yuma's PM_{10}.

17. **Issue:** Commenter asked if the "air quality committee" will evaluate the cause of the near PM_{10} exceedance and, if necessary, identify and recommend an action plan with a schedule for implementation of additional strategies as necessary to prevent an exceedance or violation of the PM_{10} standards.

Response: The contributing sources were analyzed in the Natural Events Action Plan (NEAP). Implementation of additional strategies are in the NEAP Implementation Report and outlined in this maintenance plan.

18. **Issue:** Commenter asked if the Green Valley monitoring site serves as the background site for all PM_{10} nonattainment areas in Arizona, making it the official background site for the state?

Response: Green Valley was the only rural site with a continuous PM_{10} record, so its data supplied the diurnal variation in the southern Arizona "background" areas. ADEQ has used the Organ Pipe location for background values for southern Arizona. Calexico was an excellent site for gauging the diurnal variation of particulates that would comprise some of the background PM_{10} that arrives in Yuma. Its proximity makes it more useful than Phoenix or Tucson. The California Air Resources Board and its subsidiary air quality districts are reliable operators of air pollution monitors. High terrain, if accounted for in this background analysis, would have lowered background concentrations for those trajectories passing over them. Background concentrations from the west, southwest, south, and southeast would have been unaffected.

19. **Issue:** Commenter asked if there are official criteria that a background site must satisfy to be so designated?

Response: There are federal criteria for locating all air pollution monitors, which are contained in the Code of Federal Regulations.

20. **Issue:** Concerning the Calexico site, commenter asked if ADEQ could not have picked at least an urban background site in Arizona? He asked how ADEQ could vouch for the veracity of monitoring data for a site in California?

Response: Background concentrations of PM_{10} transported into Yuma cannot be realistically correlated with concentrations in Phoenix (170 miles northeast) or Tucson (220 miles east). As a moderate sized city in an agricultural area, Calexico is likely to have diurnal patterns of emissions quite different from the larger cities. Certainly its emissions and those of the Imperial Valley to the north affect Yuma on a regular basis because of daytime westerly winds. Of all the available monitors, both filter-based and continuous, the Calexico data provided the best diurnal concentration patterns that enabled the calculation of hourly background PM_{10} values for Yuma. The Air Resources Board of California and its subsidiary Air Quality Control Districts have a sound reputation for operating and reducing data from air pollution monitors. There's no reason not to have high confidence in their data.

21. **Issue:** Commenter asked if ADEQ should have installed a background site near Yuma, but beyond the PM_{10} influence of the Yuma area, to get background readings that were truly representative of southwestern Arizona rather than south-central Arizona.

Response: A special background site outside of Yuma would have been useful, but that was beyond the scope of this plan.

22. **Issue:** Commenter asked if PM_{10} controls have been applied to background concentrations to reduce these concentrations from the base year to future years.

Response: No reductions were applied to future year background concentrations. This provides yet another conservative element to estimating future year concentrations.

23. **Issue:** Commenter asked how often do "high wind days" occur in the Yuma area which could reasonably result in elevated PM_{10} levels in the Yuma Proving Grounds area.

Response: Considering the link between high winds and elevated PM_{10} concentrations, there were nine days with PM_{10} concentrations in excess of 100 ug/m^3 (the standard is 150 ug/m^3) that also had high winds in 1991 through 2003. Since the PM_{10} sampling was done on a one-in-six-day schedule, we can assume that 54 such days would have occurred in this 13 year period, or, on average, about four high-wind days per year.

<u>PM_{10} Sources</u>

1. **Issue:** Commenter expressed concerns over two major polluting sources, the Barry M. Goldwater Air Force Range and the Bureau of Land Management (BLM) in the Yuma area.

Response: Pechan & Associates, Inc., constructed a complete inventory for PM_{10} emissions for the Yuma area for 1999 and 2016. Although a portion of the Barry M. Goldwater Air Force Range is found in the modeling domain, neither it nor BLM land was found to be a significant source of PM_{10} pollution in the Yuma area.

2. **Issue:** Commenter expressed concerns over the refinery that is planned to be built in Yuma County's Mohawk Valley.

Response: If constructed, this source will not be in the PM_{10} planning area.

3. **Issue:** Commenter asked if the sources of PM_{10} in the Yuma area changed significantly since 1985 to present.

Response: The contributing PM_{10} sources have remained constant in the Yuma area, except for significant reductions in unpaved roads.

<u>Other Comments</u>

Copious comments were sent in by one commenter who had issues with the modeling for the maintenance plan and TSD, monitoring in the Yuma area, PM_{10} control measures in the Yuma area, PM_{10} sources in the Yuma area, the nonattainment area limits, the 1991 SIP and 1994 update to the SIP, the and the redesignation process. The maintenance plan and TSD have been revised since the April 4 public hearing. The concerns have been addressed in these revisions.

8.2 Public Comments in Response to July 1, 2006, to August 7, 2006, Comment Period

ADEQ conducted a 37-day public comment period during July 1, 2006, to August 7, 2006, to receive comments on revisions to the maintenance plan and technical support document for the Yuma Moderate PM_{10} Nonattainment Area. These revisions are to the maintenance plan and technical support document originally opened for comment beginning March 3, 2006, with close of comment at the public hearing held in Yuma on April 4, 2006. The following summary has attempted to identify and combine similar comments for ease of response. Please note that all page number references are to the revisions to the maintenance plan and to the TSD as the documents appeared on the ADEQ website at: http://www.azdeq.gov/environ/air/plan/notmeet.html#yuma. Copies of the written comments, along with the documentation of the comment period, are found in Appendix K.

<u>Corrections/Editorial/Typographical Comments</u>

1. **Issue:** Commenter observed that in Table F-3 of Appendix F of the TSD the years are shown as numbers: e.g. 1,999, 2,005, 2,016.

Response: We have corrected this error, and the years are now shown as 1999, 2005, and 2016 in Table F-3 of Appendix F of the TSD.

2. **Issue:** With respect to Chapter 4.0 of the Maintenance Plan, commenter noted that on page 4-6, Tables 4-2 and 4-3 indicate 16,798 acres of unpaved agricultural roads for 1999 and 16,633 acres for 2016, respectively. Commenter stated that ADEQ determined through meetings with the farm community that there are no more than 74,000 acres in agricultural production within the nonattainment area. "According to Bobbi McDermott, with the ASCS office here in Yuma, the U. S. Department of Agriculture uses a 2% figure to calculate the reduction in gross acres due to roads, canals and ditches here in Yuma. If ADEQ was to use the 2% figure to estimate true number of acres of farm field roads then the number should be around 1,480 acres."

Response: ADEQ has revised Appendix F to the TSD and Chapter 4 of the Maintenance Plan.

3. **Issue:** Commenter stated that the difference between Harvested Acres and Net Acres should be emphasized.

Response: ADEQ concurs, and the change has been made in the submitted edition.

4. **Issue:** Commenter stated that all tables concerning fallow fields, farm roads, and agricultural tilling and cultivating, that were derived from the Pechan and Associates report should be footnoted to Appendix C. Some examples of tables that should be footnoted include Tables 2-3, 2-4, 4-2, 4-3, 4-13, 5-3, 5-4.

Response: ADEQ concurs, and the changes have been made in the submitted edition.

9.0 REFERENCES

ADEQ (1991) – "Final State Implementation Plan for the Yuma PM_{10} Nonattainment Area", Arizona Department of Environmental Quality, November 1991.

ADEQ (1994) – "Final State Implementation Plan Revision for the Yuma PM_{10} Nonattainment Area", Arizona Department of Environmental Quality, July 1994.

ADEQ (2004) – "Natural Events Action Plan for the Yuma PM_{10} Nonattainment Area", Arizona Department of Environmental Quality, February 17, 2004.

Pechan (2002) – "1999 and 2016 Emission Estimates for the Yuma, Arizona PM_{10} Nonattainment Area Maintenance Plan, Final Report", by Pechan and Associates, 2002.

U.S. EPA (1987) – "PM_{10} SIP Development Guideline", U.S. Environmental Protection Agency, OAQPS, EPA-450/2-86-001, Research Triangle Park, NC, June 1987.

U.S. EPA (1992) – "Procedures for Processing Requests to Redesignate Areas to Attainment", John Calcagni, Director, Air Quality Management Division, memorandum dated September 4, 1992.

U.S. EPA (1994) – "PM_{10} Emission Inventory Requirements", U.S. Environmental Protection Agency, OAQPS, Research Triangle Park, NC, September 1994.

U.S. EPA (1995) – "Reasonable Further Progress, Attainment Demonstration, and Related Requirements for Ozone Nonattainment Areas Meeting the Ozone National Ambient Air Quality Standard, John S. Seitz, Director, Office of Air Quality Planning and Standards (MD-10), May 15, 1995.

U.S. EPA (1996) – "Areas Affected by PM-10 Natural Events, Memorandum, 1996, Mary D. Nichols.